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FM 101-10-1

DEPARTMENT OF THE ARMY FIELD MANUAL

STAFF OFFICERS' FIELD MANUAL

ORGANIZATIONAL, TECHNICAL, AND LOGISTICAL DATA UNCLASSIFIED DATA



HEADQUARTERS, DEPARTMENT OF THE ARMY
SEPTEMBER 1969

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FIELD MANUAL }
No. 101-10-1 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 25 September 1969

Staff Officers' Field Manual

ORGANIZATION, TECHNICAL, AND LOGISTICAL DATA UNCLASSIFIED DATA

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*This manual supersedes FM 101-10-1, 10 January 1969.

CHAPTER 1

ORGANIZATION

Section I. GENERAL

1-1. Purpose and Scope

a. Purpose. This manual is for use as a planning guide only. It provides general planning data for staff officers of all echelons. Detailed reference data are found in table of organization and equipment (TOE), field manuals, technical manuals, technical bulletins, and supply bulletins as outlined in DA Pam 310-series. The principles and procedures of combat service support are contained in FM 100-10; the duties of the staff officers and the principles and procedures of staff action are contained in FM 101-5.

b. Scope. Source cutoff date for material contained in this manual is 1 January 1969. Tables and examples in chapters 1 through 7 are not, in all cases, based on latest TOE; therefore, computations must be adjusted accordingly. The TOE series used in making the calculations is indicated to permit the user to make adjustments, when needed, through the comparison of TOE.

Caution: Data contained in this manual are based on experience principally from World War II and the Korean War and can be applied to the future only with judgment and discrimination. Unless specified, these data have been adjusted to reflect current equipment capabilities, rates of fire, and so forth. Planning factors should be modified, as appropriate, to reflect specific requirements of mission, environment, enemy capabilities, and nuclear conditions. Whenever known factors are available, they should be used rather than those from this manual. This manual is applicable to nuclear and nonnuclear warfare. FM 101-10, *Staff Officers' Field Manual—Organizational, Technical, and Logistical Data*, consists of three parts published as separate volumes.

FM 101-10-1 — Unclassified Data

FM 101-10-2 — Extracts of Tables of Organization and Equipment

FM 101-10-3 — Classified Data

1-2. Recommended Changes

Users of this manual are encouraged to submit recommended changes and comments to improve the manual. Comments should be keyed to the specific page, paragraph, and line of the text in which the change is recommended. Reasons will be provided for each comment to insure understanding and complete evaluation. Comments should be prepared using DA Form 2028 (Recommended Changes to Publications) and forwarded

direct to the Commanding General, U.S. Army Combat Developments Command Institute of Combined Arms and Support, Fort Leavenworth, Kansas 66027. Originators of proposed changes that would constitute a significant modification of approved doctrine may send an information copy, through command channels, to the Commanding General, U.S. Army Combat Developments Command, Fort Belvoir, Virginia 22060.

1-3. Organization of the Department of the Army

Figure 1-1 depicts the organization of the Department of the Army, comprised of the Army Staff, the oversea commands, the U.S. Continental Army Command (USCONARC), functional commands, and the Army portion of the quick-reaction force (U.S. Army Forces, Strike Command).

a. The functional commands are represented by —

(1) The U.S. Army Materiel Command, which is responsible for testing, evaluating, and procuring Army materiel.

(2) The U.S. Army Combat Developments Command, which is responsible for Army doctrine and materiel requirements.

(3) The U.S. Army Strategic Communications Command, which is responsible for worldwide Army communications.

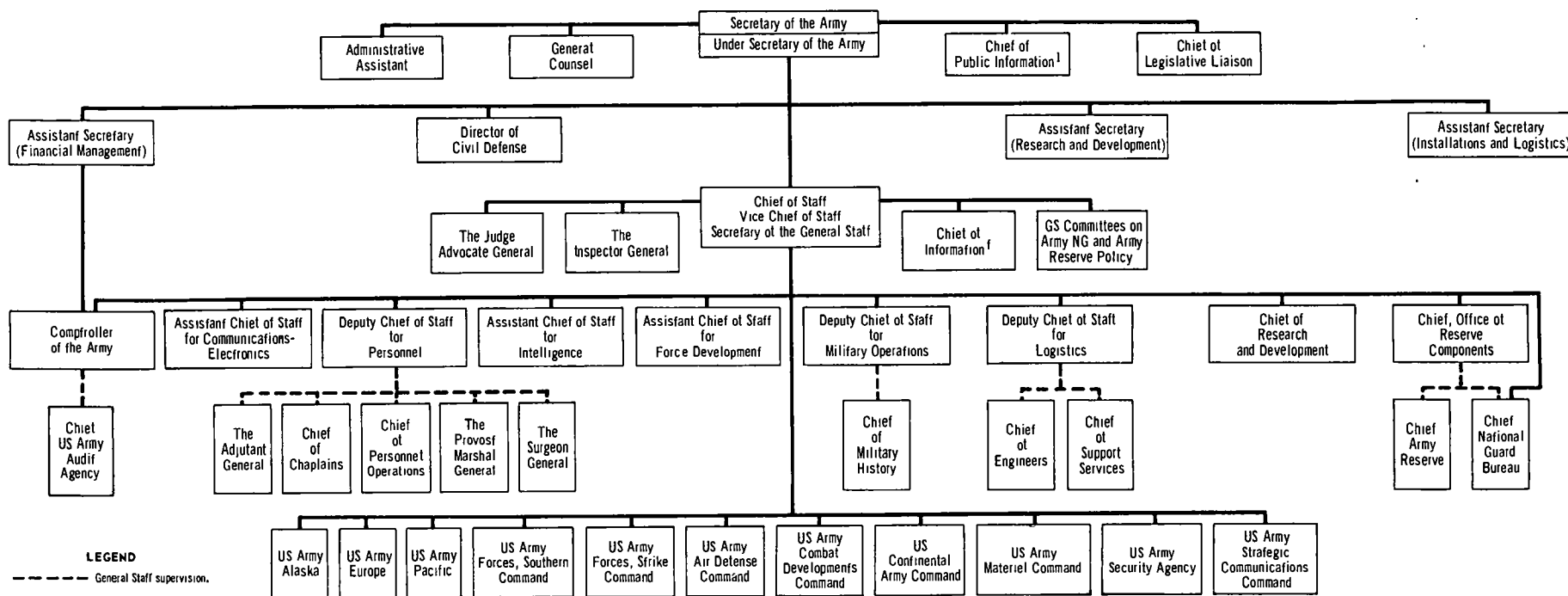
(4) The U.S. Army Security Agency, which is responsible for the security of Army communications.

(5) The U.S. Army Air Defense Command, which is responsible for the Army portion of North American air defense.

b. USCONARC is responsible for command of the five U.S. Army areas and for Army schools and class I installations.

1-4. Theater Army

a. General. In normal operations, the theater of operations is organized as a unified or a combined command. U.S. theater army headquarters is the senior U.S. Army headquarters in the theater. In a theater where only U.S. forces comprise the theater command, U.S. theater army headquarters has supervision of strategic, tactical, and combat service support operations of all U.S. Army elements. Theater army is organized to perform these operations in peace and in war. How-



¹The Chief of Public Information also serves as Chief of Information.

Figure 1-1. Organization of the Department of the Army.

ever, in time of war the U.S. theater army headquarters becomes, for all practical purposes, an administrative headquarters for the support of U.S. Army forces.

b. *Composition.* Figure 1-2 outlines the basic elements of a theater army command. The commanders of both the field army and the theater army support command (TASCOM) are assigned all the means needed to perform their missions in the combat and the communications zones, subject to policy guidance and direction of the theater commander. For details on theater army subordinate commands, see paragraphs 1-6 and 1-7 and FM 54-8 (Test).

(1) *Headquarters.* Theater army headquarters has no prescribed organization. It consists of elements necessary to provide command and con-

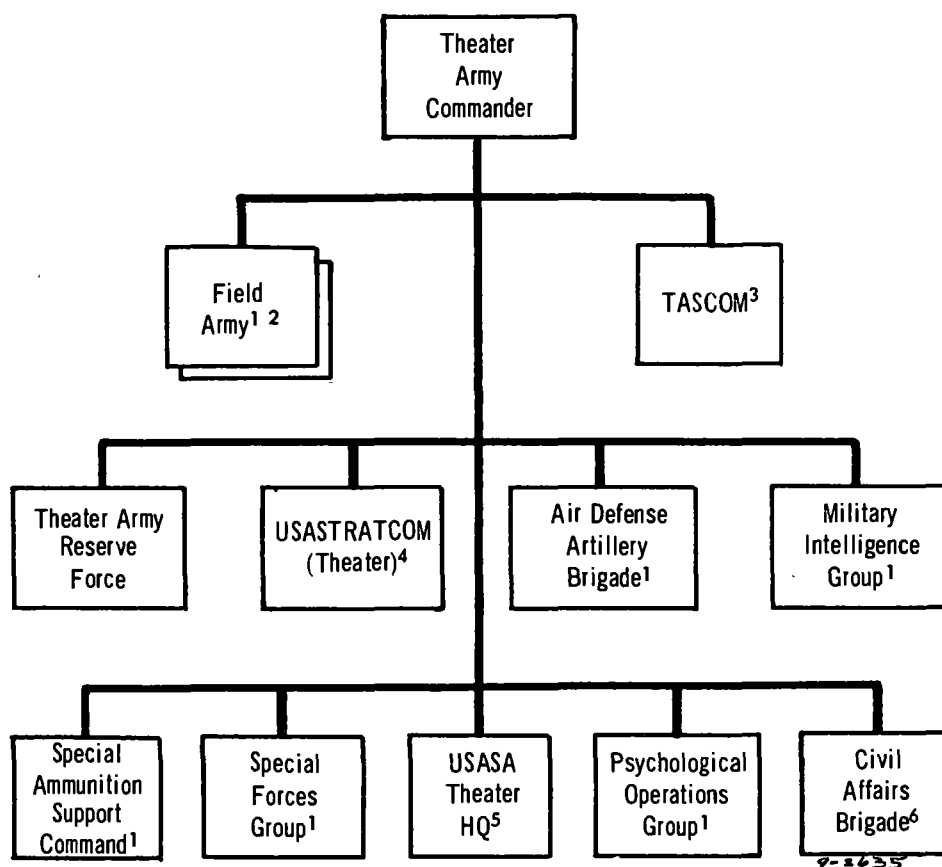
trol of assigned forces. The allotment and grouping of these forces is based on the mission assigned.

(2) *Assigned forces.* Forces assigned to U.S. theater army may consist of —

(a) Combat forces — Those forces whose primary missions are to participate in combat.

(b) Combat support troops — Those units or organizations whose primary mission is to furnish operational assistance for the combat elements.

(c) Combat service support elements — Those elements whose primary missions are to provide service support to combat forces and which are a part, or prepared to become a part, of a theater, command, or task force formed for combat operations.



¹ Under the operational command of the unified commander in wartime (except military intelligence group technical intelligence units).

² Army groups may be necessary when several field armies are employed.

³ Functions of HQ, TASCOM, may be assumed by HQ, theater army, in wartime.

⁴ Under operational control of the theater army commander.

⁵ Provides support in accordance with AR 10-122.

⁶ May be assigned or attached to a theater army, TASCOM, or ASCOM and may be under the operational command of the unified command commander in wartime.

Figure 1-2. Theater army structure.

1-5. Army Group

a. General. The army group directs the strategic and tactical operations of two or more field armies or similar tactical groupings. When only U.S. forces comprise the theater command, army groups, if employed, operate under the direct control of the U.S. theater army commander. When operating as part of a multinational theater, strategic direction may originate in a superior land force headquarters.

b. Composition.

(1) *Headquarters.* Army group headquarters has no prescribed organization. It consists of elements necessary to exercise strategic and tactical control of its assigned forces. Army group does not normally operate combat service support installations.

(2) *Assigned forces.* Forces assigned to an army group may consist of —

- (a) Field armies.
- (b) Independent corps.
- (c) Divisions.

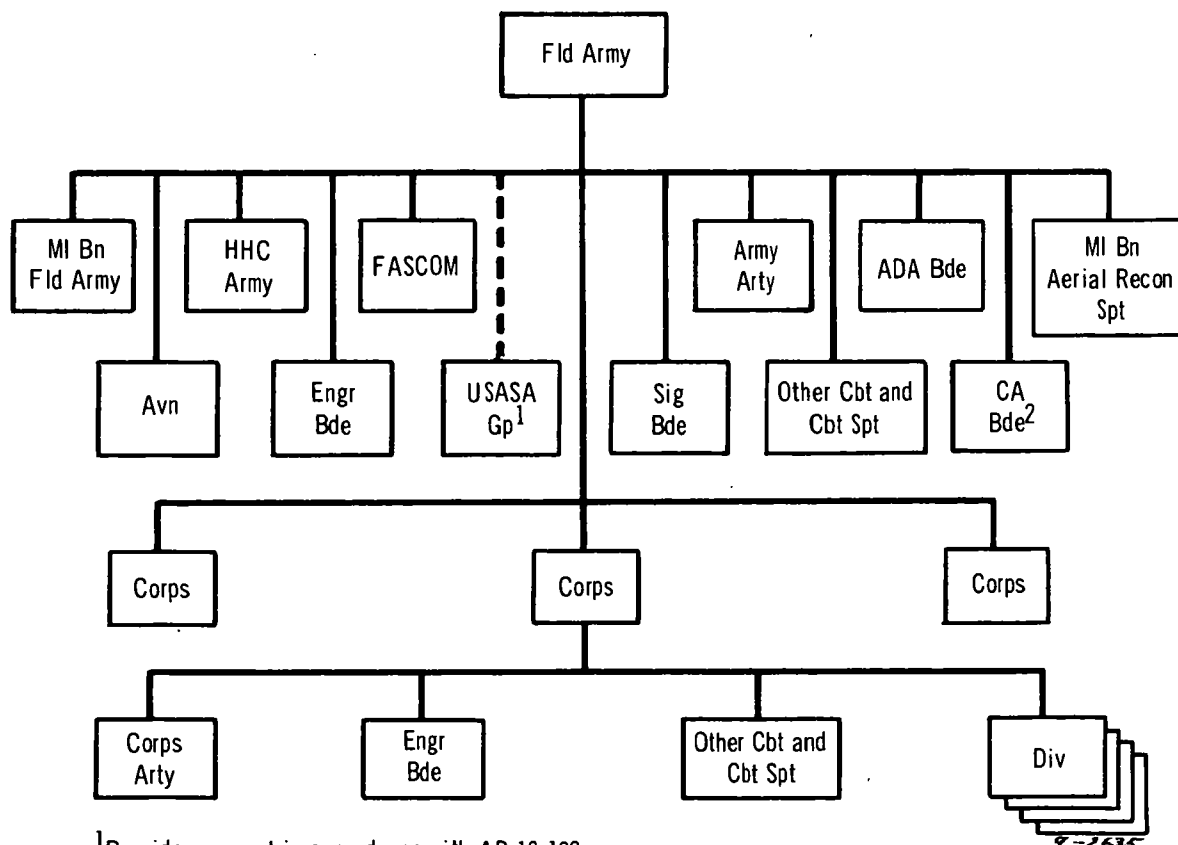
Section II. FIELD ARMY, CORPS, AND FIELD ARMY SUPPORT COMMAND

1-6. Field Army

a. General. The field army is a tactical and an administrative organization capable of independent operations. Normally, it consists of a headquarters; certain assigned field army troops; a field army support command (FASCOM) headquarters; and a variable number of corps, divisions, and reinforcing combat, combat support, and combat service support troops. Figure 1-3 illustrates the major organizations of a typical field army.

b. FASCOM. The mission of the FASCOM is to provide, within assigned responsibilities, combat service support to a field army (or other supported forces). The support command is also responsible for rear area protection for the field army service area. Functions performed by the support command include —

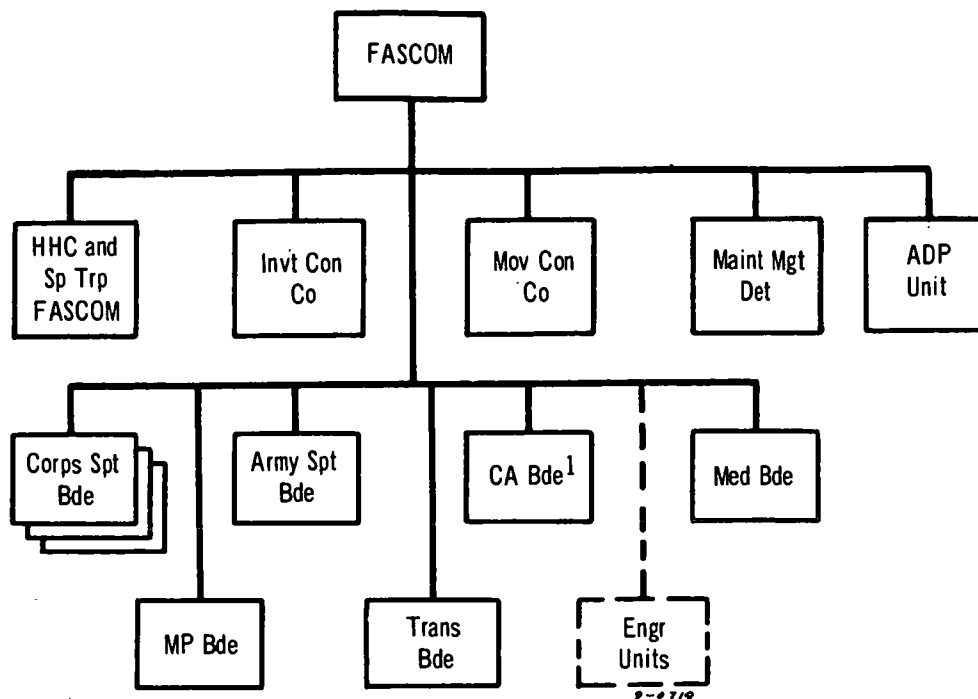
- (1) Administration.
- (2) Civil affairs/Psychological operations.
- (3) Construction, when required, through attached units.



¹Provides support in accordance with AR 10-122.

²May be assigned or attached to a fld army or a FASCOM.

Figure 1-3. Major field army units.



¹May be assigned or attached.

LEGEND

 Attached when required.

Figure 1-4. Support for a 12-division field army.

- (4) Maintenance.
- (5) Military police.
- (6) Movements.
- (7) Supply.
- (8) Services — comptroller, general, medical, personnel.
- (9) Transportation.

Figure 1-4 illustrates a typical FASCOM for a 12-division field army; figure 1-5 shows the support brigades within the support command.

c. Typical Field Army Units.

(1) Army field forces are tailored for specific tactical situations and geographical areas. The illustrations below are intended to imply a typical combat force with the combat support and combat service support necessary to sustain operations. Tables 1-1 through 1-4 list those units available for tailoring the force to meet the specific situation.

(2) The composition of a typical field army by branch or mission is contained in tables 1-1 through 1-4. Major subordinate units of divisions listed in these tables may be identified from TOE

in column 2 of table 6-3. The typical army division and the division base are listed in figures 1-6 and 1-7. These tables and figures do not include cellular teams or service detachments. For information on these teams refer to FM 101-10-2. (See also para 2-2.)

1-7. Corps

a. *General.* When operating as part of a field army, the corps is primarily a tactical organization of execution; however, when operating independently, the corps exercises both tactical and administrative functions. The corps consists of a headquarters; certain assigned corps troops; and a variable number of divisions and reinforcing combat, combat support, and, in the case of an independent corps, combat service support troops.

b. *Corps Headquarters.* TOE 52-1 shows the composition of a corps headquarters.

c. *Typical Corps Units.* Figure 1-3 shows the units that may be included in a typical corps comprised of one armored, one infantry, and two infantry (mechanized) divisions.

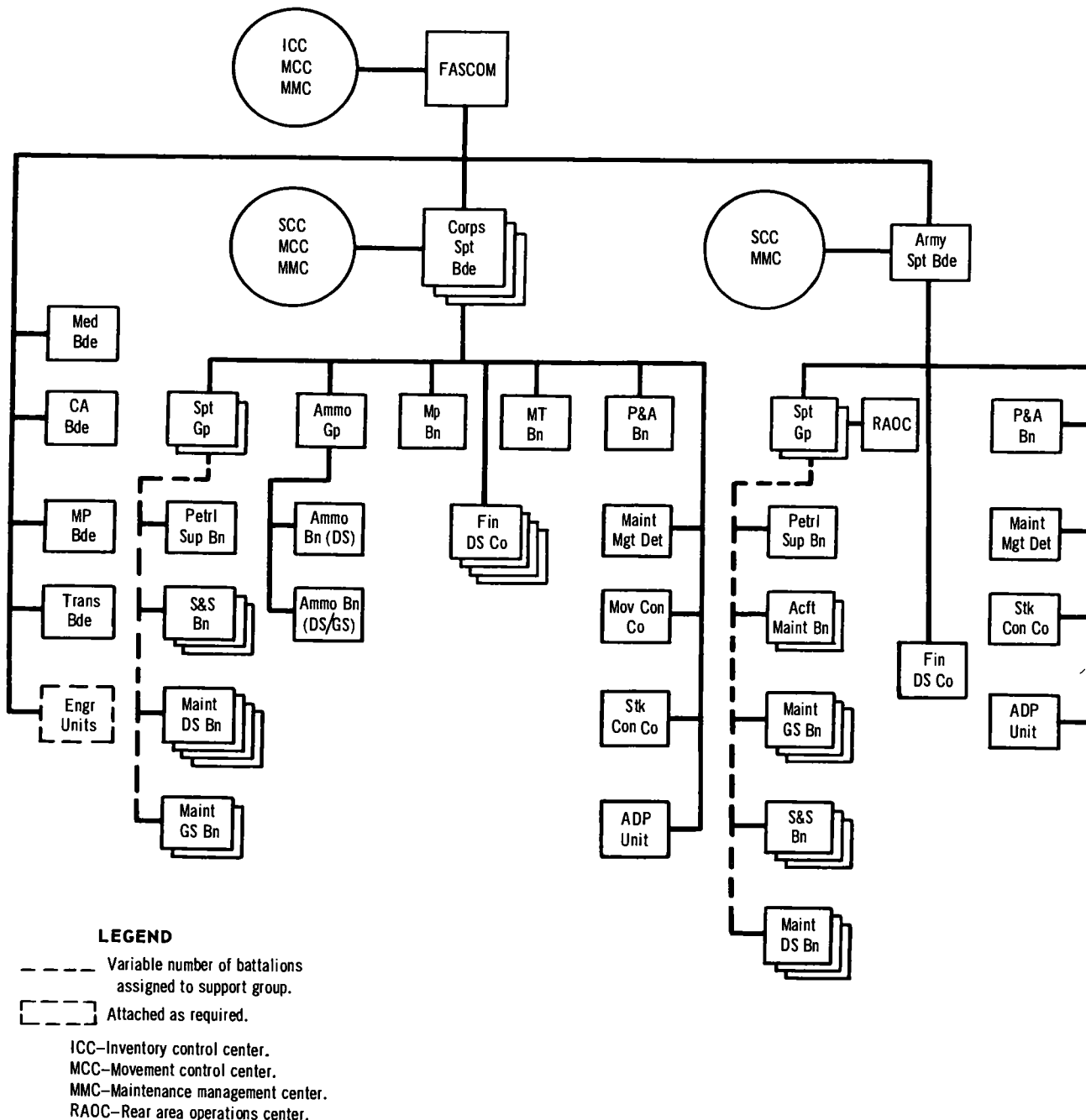


Figure 1-5. The support brigades for a 12-division field army.

Table 1-1. Major Field Army Units — Command and Control

1	2	3	4	5	6	7
Unit	TOE	TOE str	Corps	FASCOM	Fld army	Total fld army
2 HHC, spt gp, army	29-102G	175	---	2	---	2
3 HHC, spt gp, corps	29-102G	142	(2)	6	---	6
4 HHC, army	51-1G	667	---	---	1	1
5 HHC, corps	52-1G	259	1	---	---	3
6 HQ and sp trp, FASCOM	54-12T	392	---	1	---	1
7 HHC, spt bde, army	54-22T	204	---	1	---	1
8 HHC, spt bde, corps	54-22T	204	(1)	3	---	3

Note. Numbers in parentheses indicate areas where any or all units are employed. They are part of the totals in the other columns.

Table 1-2. Major Field Army Units — Combat Units

1	Unit	2	3	4	5	6	7
		TOE	TOE atr	Corps	FASCOM	Fld army	Total fld army
<i>Divisions</i>							
2	Inf div (typical div).....	7G	17,473 ^a b	1	-----	---	3
3	Armd div (typical div).....	17G	18,057 ^a c	1	-----	---	3
4	Inf div, (mech) (typical div).....	37G	18,020 ^a d	2	-----	---	6
5	Abn div.....	57G	13,484	---	-----	---	---
6	Airmbl div (typical div).....	67T	16,624	---	-----	---	---
<i>Sep bde base</i>							
7	Sep inf bde.....	7-100G	2,196	---	-----	---	---
8	Sep armd bde.....	17-100G	2,189	---	-----	---	---
9	Sep inf bde (mech).....	37-100G	2,189	1	-----	---	3
10	Sep lt inf bde.....	77-100G	1,652	---	-----	---	---
11	Sep abn bde.....	57-100G	1,713	---	-----	---	---
<i>Inf units</i>							
12	Inf bn, sep inf bde.....	7-15G	849	---	-----	---	---
13	Inf bn, (mech) sep bde.....	7-45G	924	2	-----	---	6
14	Inf bn, sep lt inf bde.....	7-175G	812	---	-----	---	---
<i>Armor units</i>							
15	Sep tk bn (It).....	17-15T	581	---	-----	---	---
16	Tk bn, sep armd bde.....	17-35G	599	2	-----	---	6
17	Armd cav regt.....	17-51G	3,483	1	-----	1	4

^aStr when equipped with MAB. Str increased by 2 when engineers are equipped with MT 46 bridging.^b8 inf bn, 2 tk bn per div; also includes 1 Chap/Vulc ADA bn, TOE 44-325T.^c6 tk bn, 5 tk bn per div; also includes 1 Chap/Vulc ADA bn, TOE 44-325T.^dmech inf bn, 3 tk bn per div; also includes 1 Chap/Vulc ADA bn, TOE 44-325T.

Table 1-3. Major Field Army Units — Combat Support Units

1	Unit	2	3	4	5	6	7
		TOE	TOE str	Corps	FASCOM	Fld army	Total fld army
<i>FA units</i>							
2	HHB, FA gp.....	6-401G	135	4	-----	---	12
3	FA bn, 155-mm, towed.....	6-425G	563	2	-----	---	6
4	FA bn, 175-mm, SP.....	6-435G	550	4	-----	---	12
5	FA bn, 8-in, SP.....	6-445G	561	6	-----	---	18
6	FA bn, 155-mm, SP.....	6-455G	506	4	-----	---	12
7	HHB, corps arty.....	6-501G	211	1	-----	---	3
8	FA bn, HJ.....	6-525G	408	2	-----	---	6
9	FA bn, SGT.....	6-555G	377	1	-----	---	3
10	FA btry, slt.....	6-558G	154	1	-----	---	3
11	FA tgt acq bn.....	6-575G	768	1	-----	---	3
12	FA bn, PERSH.....	6-615G	1,678	---	-----	1	1
<i>ADA units</i>							
13	HHB, ADA bde.....	44-2G	79	---	-----	1	1
14	HHB, ADA gp.....	44-12G	79	1	-----	2	5
15	ADA bn, Hawk.....	44-235G	772	1	-----	4	7
16	ADA bn, Hawk (SP).....	44-255T	825	3	-----	---	9
17	ADA bn, Chap/Vjlc (div).....	44-325T	758	4	-----	---	12
18	ADA Chap/Vulc bn.....	44-725T	775	1	-----	3	6
<i>Avn units</i>							
19	Avn co (airmb).....	1-77G	189	4	-----	---	12
20	Avn aerial wpn co.....	1-111T	200	2	-----	---	6
21	Corps avn co.....	1-127D	163	1	-----	---	3
22	Avn aerial survl co.....	1-128T	297	1	-----	---	3
23	AAVN co.....	1-137D	165	---	-----	1	1
24	Avn ATC unit.....	1-207G	222	---	-----	1	1
25	HHC, avn gp.....	1-252G	76	1	-----	---	3
26	HHC, avn bn.....	1-256G	77	2	2	---	8
27	Avn mdm hel co.....	1-258G	239	4	4	---	16
28	Avn hv hel co.....	1-259G	129	---	1	---	1
29	Avn svc spt co.....	1-407G	165	---	1	---	1
<i>Cml units</i>							
30	HHD, cml smoke genr bn.....	3-266G	29	1	-----	1	4
31	Cml smoke genr co.....	3-267G	147	4	-----	4	16
32	Cml mech flame co.....	3-357T	170	1	-----	---	3

Table 1-3—Continued

1	Unit	2 TOE	3 TOE str	4 Corps	5 FASCOM	6 Fld army	7 Total fld army
<i>Engr units</i>							
33	Engr cbt bn, army or corps	5-35G	836	8	-----	12	36
34	HHC, engr cbt gp	5-52G	114	2	-----	3	9
35	Engr aslt brg co, mbl	5-64G	205	2	-----	---	6
36	Engr pnl brg co	5-77G	129	2	-----	6	12
37	Engr fitbrg co	5-78G	234	2	-----	6	12
38	Engr cam co	5-97G	74	1	-----	---	3
39	HHC, engr cbt bde, army	5-101G	146	---	-----	1	1
40	HHC, engr cbt bde, corps	5-101G	236	1	-----	---	3
41	Engr dptrk co	5-124G	114	2	-----	3	9
42	Engr topo bn, army	5-305G	368	---	-----	1	1
43	Engr topo co, corps	5-327G	143	1	-----	---	3
44	HHC, engr amph bde	5-401G	111	1	-----	---	3
45	HHC, engr amph gp	5-402G	90	1	-----	---	3
46	Engr amph bn	5-405G	716	1	-----	---	3
<i>MI units</i>							
47	MI bn, air recon spt, fld army	30-5G	281	---	-----	1	1
48	MID, sep inf bde	30-14G	32	1	-----	---	3
49	MID, armd cav regt	30-14G	32	1	-----	1	4
50	Mil intel co	30-17G	85	4	-----	---	12
51	MID, corps	30-18G	72	1	-----	---	3
52	MI bn, fld army	30-25G	752	---	-----	1	1
53	Inf LRP co	7-157G	216	1	-----	---	3
<i>Army Security Agency Units</i>							
54	HHC, ASA gp	32-52G	229	---	-----	1	1
55	HHC, ASA bn	32-56G	181	1	-----	---	3
56	ASA div spt co	32-57G	347	4	-----	---	12
57	ASA op co (A)	32-67G	347	---	-----	3	3
58	ASA co (proc)	32-77G	236	---	-----	1	1
59	ASA co (scty)	32-78G	133	---	-----	1	1
<i>Sig units</i>							
60	Corps sign bn	11-15G	1,173	1	-----	---	3
61	Army comd and sig radio cable bn	11-75G	908	---	-----	1	1
62	Sig army area bn	11-85G	837	---	-----	6	6
63	Army comd sig op bn	11-95G	1,113	---	-----	1	1
64	HHC, army sig bde	11-102G	298	---	-----	1	1
65	Sig op co, mdm HQ	11-127G	203	---	1	---	1
66	Sig small HQ op co	11-147G	126	(1)	4	(1)	4
67	ADA sig spt bn	11-175G	331	---	-----	1	1
68	ADA sig co	11-337G	193	1	-----	2	5

Table 1-4. Major Field Army Units — Combat Service Support Units

1	Unit	2 TOE	3 TOE str	4 Corps	5 FASCOM	6 Fld army	7 Total fld army
<i>Ammo units</i>							
2	HHC ammo DS/GS gp	9-22G	92	(1)	3	---	3
3	HHC, ammo bn, DS/GS	9-36G	108	(2)	6	---	6
4	Ammo co, convl	9-38G	315	(6)	18	---	18
5	Ord sp ammo DS co	9-47G	270	(3)	9	---	9
6	Ord sp ammo co, GS/DS	9-48G	174	(1)	3	---	3
7	Ord co, GM GS maint	9-59G	325	(1)	3	---	3
8	PERSH GS maint co	9-577G	114	---	1	---	1
<i>CA units</i>							
9	HHC, CA bde	41-201G	239	---	1	---	1
<i>Maint units</i>							
10	Tire rep co	9-117G	160	---	1	---	1
11	LE GS maint co, army	29-134G	276	(2)	9	---	9
12	HHD, maint DS or GS bn, army	29-136G	63	(6)	25	---	25
13	Hv equip GS maint co, army	29-137G	298	(6)	24	---	24
14	Coll and clas co	29-139G	216	(1)	4	---	4
15	Lt maint co, DS	29-207G	214	(8)	32	---	32
16	Maint co, rear, DS	29-208G	305	(4)	16	---	16

Table 1-4—Continued

1	2	3	4	5	6	7
Unit	TOE	TOE str	Corps	FASCOM	Fld army	Total fld army
17 Maint mgt det, FASCOM.....	29-403T	32	---	1	---	1
18 Maint mgt det, spt bde.....	29-403T	71	(1)	4	---	4
19 Trans acft DS co.....	55-457G	265	(4)	16	---	16
20 Trans acft maint GS co.....	55-458G	290	(4)	18	---	18
<i>Med units</i>						
21 Med holding co.....	8-57G	91	---	3	---	3
22 HHD, med bde.....	8-112G	71	---	1	---	1
23 HHD, med gp.....	8-122G	37	---	6	---	6
24 Cbt spt hosp.....	8-123T	167	1	---	---	3
25 HHD, med bn.....	8-126G	39	---	9	---	9
26 Med amb co.....	8-127G	102	---	15	---	15
27 Med clr co.....	8-128G	130	---	15	---	15
28 Med coll co.....	8-129G	191	---	3	---	3
29 Med air amb co.....	8-137G	202	---	3	---	3
30 Med co, sep bde.....	8-147G	132	1	---	1	4
31 PVNTMED svc unit, fld.....	8-204G	123	---	1	---	1
32 MASH.....	8-571G	121	---	12	---	12
33 Evac hosp.....	8-581G	318	4	24	---	24
34 Conv cen.....	8-590G	264	---	1	---	1
35 Med lab.....	8-650G	114	---	1	---	1
36 Army med dep.....	8-667G	226	---	1	---	1
<i>MP units</i>						
37 MP ESCRG co.....	19-47G	140	---	3	---	3
38 HHD, MP bn.....	19-76G	59	(1)	5	---	5
39 MP co.....	19-77	186	(4)	22	---	22
40 MP phys sety co.....	19-97G	143	(1)	3	---	3
41 MP gd co.....	19-247G	127	---	2	---	2
42 HHD, MP bde.....	19-262G	61	---	1	---	1
<i>S&S units</i>						
43 HHC, petrl sup bn.....	10-226G	84	(1)	5	---	5
44 Petrl sup co.....	10-227G	306	(1)	6	---	6
45 QM air dlvr co.....	10-407G	271	---	1	---	1
46 Fld svc GS co, fwd.....	29-114G	306	(4)	12	---	12
47 Gen sup GS co, fwd.....	29-118G	215	(4)	16	---	16
48 Rep parts GS co, fwd.....	29-119G	226	(2)	6	---	6
49 Rep parts GS co, army.....	29-119G	295	---	2	---	2
50 Fld svc GS co, army.....	29-124G	295	---	2	---	2
51 Hv mat sup GS co.....	29-127G	199	(1)	5	---	5
52 Acft and msl rep parts sup co, GS.....	29-129G	274	(1)	2	---	2
53 HHC, S&S bn.....	29-146G	100	(3)	12	---	12
54 S&S co, DS.....	29-147G	303	(4)	16	---	16
55 Invt con co, FASCOM.....	29-402G	267	---	1	---	1
56 Stk con co, spt bde.....	29-404T	187	(1)	4	---	4
<i>Trans units</i>						
57 HHD, trans MCC.....	55-6G	166	(1)	4	---	4
58 Trans mov con co, corps spt bde.....	55-7T	79	(1)	3	---	3
59 HHD, TMT bn.....	55-16G	43	(1)	5	---	5
60 Trans lt trk co (2 1/2-ton).....	55-17G	175	---	2	---	2
61 Trans lt trk co (5-ton).....	55-17G	179	(1)	3	---	3
62 Trans mdm trk co (cgo).....	55-18G	183	---	4	---	4
63 Trans mdm trk co (petrl).....	55-18G	384	---	15	---	15
64 Trans car co, army.....	55-19G	109	(1)	4	---	4
65 Trans hv trk co.....	55-28G	155	(1)	5	---	5
66 Trans tac carr co.....	55-47D	180	1	---	---	3
67 HHC, trans bde.....	55-62F	105	---	1	---	1
68 Trans lt-mdm trk co.....	55-67G	202	(6)	24	---	24
69 Trans tml trf co.....	55-118G	266	---	3	---	3
<i>Pers svc units</i>						
70 SPS det (AB, 4FA).....	12-18G	42	(1)	4	---	4
71 HHD, P&A bn.....	12-66G	51	(1)	4	---	4
72 Pers svc co (type A).....	12-67G	74	(4)	17	---	17
73 Army band.....	12-107G	43	(1)	5	---	5
74 Fin DS co.....	14-17G	115	(4)	17	---	17
75 Pers svc co (type B).....	12-67G	646	---	---	---	---

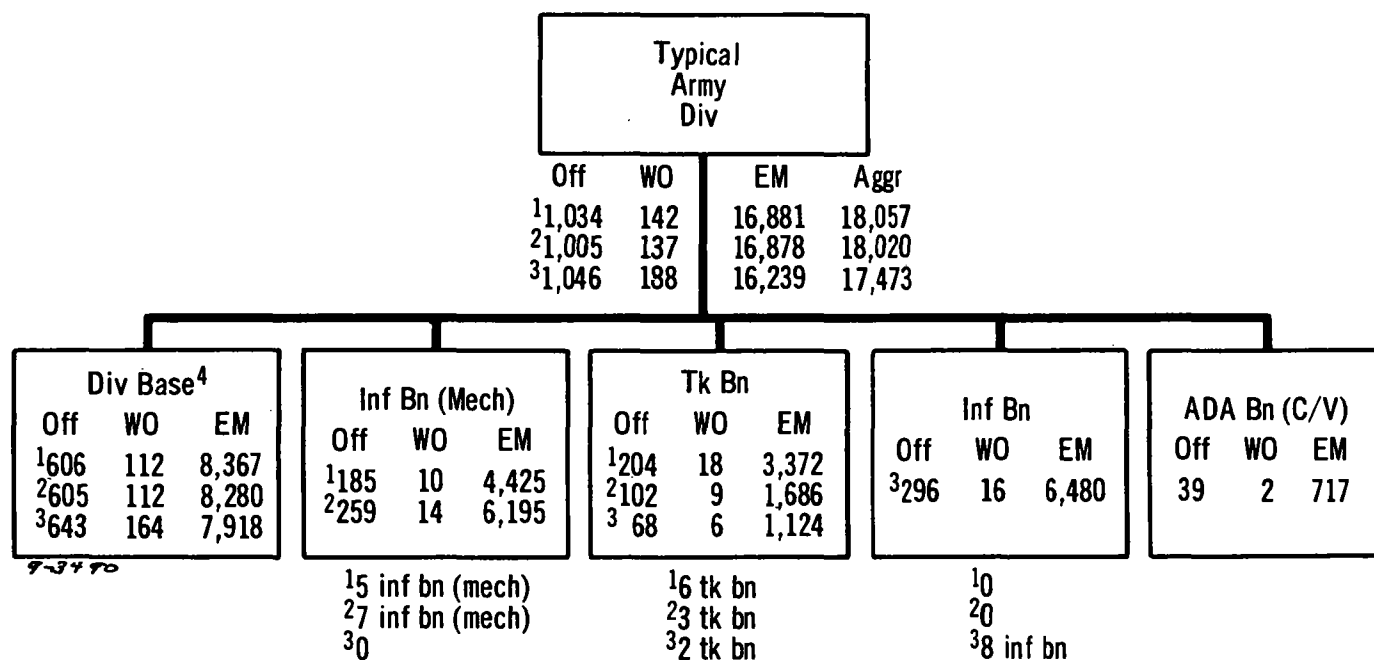
Section III. DIVISIONS

1-8. Divisions

Organization charts and tables of major equipment items are illustrated for the armored, infantry, infantry (mechanized), airmobile, and airborne divisions. Major elements of each division may be grouped by the three categories of combat, combat support, and combat service support, as are elements of the field army. However, since divisions, as a whole, are considered combat units, they are not divided into categories in this manual. Figures 1-6 through 1-9 show organization charts for the divisions, and tables 1-5 through 1-24 show items of major equipment.

1-9. Typical Divisions

Figure 1-6 provides specific organizational structures and TOE strengths for a typical army division found in a three-corps field army, with each corps composed of one armored, one infantry, and two infantry (mechanized) divisions (strengths shown for only one of each type of division). Each of these three types of divisions has a division base and specific numbers of combat battalions. Tables 1-5 through 1-9 provide summaries of the three divisions' weapons and missiles, aircraft, group support material, vehicles, and general equipment. These tables show totals for each item of equipment for the entire division, whereas major divisional units are shown under division base in the next paragraph.



¹Unit totals when organic to armd div.

²Unit totals when organic to inf div (mech).

³Unit totals when organic to inf div.

⁴Unit totals include engr when equipped with M4T6 or class 60 bridging; with MAB, there are 2 EM less.

Figure 1-6. Typical army division.

Table 1-5. Summary of Divisions—Weapons and Missiles

1	LIN	2 Nomenclature	3		5 7G Inf div	6		7		8	
			17G Armd div	Div base 4 37G Inf div (mech)		Armd div base 6 tk bn (17-35G) 5 inf bn (mech) (7-45G) Chap/Vulc bn (44-325T)	6 tk bn (17-35G) 5 inf bn (mech) (7-45G) Chap/Vulc bn (44-325T)	Inf div (mech) base 3 tk bn (17-35G) 7 inf bn (mech) (7-45G) Chap/Vulc bn (44-325T)	Inf div (mech) base 3 tk bn (17-35G) 7 inf bn (mech) (7-45G) Chap/Vulc bn (44-325T)	Inf div base 2 tk bn (17-35G) 8 inf bn (7-15G) Chap/Vulc bn (44-325T)	Inf div base 2 tk bn (17-35G) 8 inf bn (7-15G) Chap/Vulc bn (44-325T)
02	A90117	Armt, subsys, hel, 7.62-mm mg, lt.....	6	6	31		6		6		31
03	A90426	Armt, subsys, hel, 7.62-mm mg, 2.75-in RL, high rate.....	7	7	13		7		7		13
04	A90460	Armt, subsys, hel, 40-mm, GL.....	7	7	13		7		7		13
05	F56577	Cbt engr veh, FTRAC.....	8	8	4		8		8		4
06	G02204	Detecting set, mine, AN/PRS-4.....	2	2	2		7		7		7
07	G02341	Detecting set, mine ptbl, metallic.....	86	87	80		125		118		125
08	J93997	Guidance and launching sta, with equip (Entac).....					15		21		24
09	J96694	Gun antiaircraft arty, SP, 20-mm.....					32		32		32
10	K12718	Hdlg unit, rkt, tlr-ktd, 7.62-mm, with equip (HJ).....	8	8	8		8		8		8
11	K27486	Heating and tie-down unit, 7.62-mm rkt, trk-mtd, with equip (HJ).....	8	8	8		8		8		8
12	K56981	How, hv, SP, 8-in.....	4	4	4		4		4		4
13	K57529	How, towed, 105-mm.....			54						54
14	K57666	How, mdm, SP, 155-mm.....	72	72			72		72		
15	K57803	How, mdm-towed, 155-mm.....			18						18
16	L44575	Lchr, gren, 40-mm.....	478	478	382	1,094		1,225		1,132	
17	L45123	Lchr, rkt, multiple, 155-mm.....	9	9	9	9		9		9	
18	L45534	Lchr, rkt, 7.62-mm, trk-mtd, with equip (HJ).....	4	4	4	4		4		4	
19	L91975	Mg, cal .50, hv, flex, for gnd use.....	57	57	57	309		291		205	
20	L92386	Mg, 7.62-mm, lt, flex.....	303	304	295	592		679		523	
21	M68008	Mort, 81-mm, on mount.....				45		63		72	
22	M68282	Mort, 4.2-in, on mount.....	9	9	9	53		49		49	
23	M75577	Mount, tripod, mg, hv, cal .50.....	57	57	57	309		291		205	
24	M75714	Mount, tripod, mg, 7.62-mm.....	303	304	295	592		679		523	
25	M96741	Pistol, cal .45 auto.....	1,226	1,224	1,100	4,509		4,050		3,723	
26	R50543	Recov, veh, FTRAC, lt armd.....	12	12	6	42		52		11	
27	R50680	Recov, veh, FTRAC, mdm.....	7	7	5	37		22		15	
28	R91107	Revolver, cal .38, 2-in bbl.....	2	2	2	2		2		2	
29	R91244	Revolver, cal .38, 4-in bbl.....	121	121	252	122		121		252	
30	R95114	Rifle, 7.62-mm.....	7,651	7,565	7,382	12,912		13,210		12,941	
31	R95251	Rifle, 7.62-mm, auto, with bipod.....	185	191	185	571		685		749	
32	R96484	Rifle, rcl, 90-mm.....	15	15	15	105		141		159	
33	R96758	Rifl, rcl, 106-mm, on mount.....				30		42		64	
34	U56346	Smg, cal .45.....	44	44	38	812		478		284	
35	V12826	Tk, cbt, FTRAC, 7.62-mm.....	27	27	27	27		27		27	
36	V13100	Tk, cbt, FTRAC, 105-mm gun.....				324		162		108	
37	Z32821	GM sys, intep, aerial, carr-mtd (Chap).....				32		32		32	

Table 1-6. Summary of Divisions' Aircraft

TABLE OF SUMMARY OF DIVISIONS (Continued)																
1			2		3		Div base 4		5		6		Typical div 7		8	
1	LIN	Nomenclature		17G Armd div	37G Inf div (mech)	7G Inf div	Armd div base 6 tk bn (17-35G) 5 inf bn (mech) (7-45G) Chap/Vulc bn (44-325T)		Inf div (mech) base 3 tk bn (17-35G) 7 inf bn (mech) (7-45G) Chap/Vulc bn (44-325T)		Inf div base 2 tk bn (17-35G) 8 inf bn (7-15G) Chap/Vulc bn (44-325T)					
02	K30645	Hel, obsn, OH-6A.....		34	34	34	34		34		34					
03	K31749	Hel, util, UH-1B.....		13	13	19	13		13		19					
04	K31786	Hel, util, UH-1D.....		10	10	35	10		10		35					

Table 1-7. Summary of Divisions' Ground Support Materiel

		Div base							Typical div		8	
1	2	3	4	5	6	7	8	9	10	11	12	
LIN	Nomenclature	17G Armd div	37G Inf div (mech)	7G Inf div	Armd div base 6 tk bn (17-35G) 5 inf bn (mech) (7-45G) Chap/Vulc bn (44-325T)	Inf div (mech) base 3 tk bn (17-35G) 7 inf bn (mech) (7-45G) Chap/Vulc bn (44-325T)	Inf div base 2 tk bn (17-35G) 8 inf bn (7-15G) Chap/Vulc bn (44-325T)					
02	C20414	Brg, armd veh launchd, scissor-type, c1-60, aluminum, 60-ft lgth of span	6	6	6	18	12				10	
03	C25072	Brg, fltg, hwy, aluminum deck, balk superstruc (army)	0	0	0	0	0				0	
04	C25346	Brg, fltg, hwy, c1-60, 135-ft (army)	0	0	0	0	0				0	
05	C25620	Brg, fltg, mbl aslt, amph, 36-ft 1-in lg, 10-ft wide, 4-in high ..	16	16	16	16	16				16	
06	C25757	Brg, fltg, raft sec, lt tac	2	2	2	2	2				2	
07	C26305	Brg erection set, fltbrg, c1-60, stl-aluminum deck, balk superstruc	0	0	0	0	0				0	
08	C29490	Bucket, clamshell, ¾-cu yd	2	2	1	2	2				1	
09	C30997	Bucket, dragline, ¾-cu yd	1	1	1	1	1				1	
10	E69242	Compressor, recip, pwr-driven, air rcvr, gas-driven, 15-cfm, 175-psi				12	11				3	
11	E70064	Compressor, recip, pwr-driven trk, 2-whl, pneu tires, gas-driven, 5-cfm, 175-psi	4	5	4	9	10				9	
12	E73626	Compressor, rot, pwr-driven, air, wheelbarrow frame, gas, 60-cfm, 6.5-psi	5	8	8	5	8				8	
13	F39241	Crane, whl-mtd, 5-ton, ⅜-cu yd, diesel, 4x4, rough terrain, airtrans	4		4	4					4	
14	F39378	Crane, whl-mtd, 20-ton, ¾-cu yd, rough terrain	3	3	3	3	3				3	
15	G69235	Drum, hdlg atch, forklift trk, chime ring hook	1	1	1	1	1				1	
16	H32869	Fairlead roller and sheave, 12 ½-ton crane-shovel, crawler, 20-ton crane-shovel, trk			1						1	
17	H38787	Ferry conversion set, raft, inf spt	2	2	2	2	2				2	
18	J35561	Genr set, diesel-eng tm, 45-kw, 60-cy, 3-ph, ac, 120/208—240/416-v, PU-407M	2	2	2	2	2				2	
19	J35698	Genr set, diesel-eng, trk-mtd, 45-kw, 60-cy, 3-ph, ac, 120/208—240/416-v, PU-408/M	2	2	2	2	2				2	

Table 1-7—Continued

1		2	3	4	5	6	7	8
1	LIN	Nomenclature	17G Armd div	37G Inf div (mech)	7G Inf div	Armd div base 6 tk bn (17-35G) 5 inf bn (mech) (7-45G) Chap/Vulc bn (44-325T)	Typical div 7 Inf div (mech) base 3 tk bn (17-35G) 7 inf bn (mech) (7-45G) Chap/Vulc bn (44-325T)	Inf div base 2 tk bn (17-35G) 8 inf bn (7-15G) Cbap/Vulc bn (44-325T)
20	J35835	Genr set, diesel-eng, 15-kw, 60-cy, 3-ph, ac, 120/208—240/416-v, 50-cy, skid.....	3	3	3		3	3
21	J36109	Genr set, diesel-eng, 30-kw, 60-cy, 3-ph, ac, 120/208—240/416-v, 50-cy, skid.....	1	1	1		1	1
22	J37342	Genr set, disel-eng, 45-kw, 400-cy, 3-ph, ac, 120/208—240/416-v, skid.....					2	2
23	J41178	Genr set, gas-eng, tlr-mtd, PU-290/MR.....	21	21	19		21	19
24	J41315	Genr set, gas-eng, tlr-mtd, PU-294/G.....	3	3	2		4	3
25	J41589	Genr set, gas-eng, tlr-mtd, PU-322/G.....	1	1	1		1	1
26	J41931	Genr set, gas, tlr-mtd, PU-456/G.....			1			1
27	J42274	Genr set, gas-eng, 0.15-kw, 60-cy, 1-ph, ac, 120-v, skid.....	20	21		20	21	
28	J42685	Genr set, gas-eng, 0.3-kw, ac, 115-v, 1-ph, 400-cy, dc, 24—35-v.....	6	6	6	50	46	46
29	J42822	Genr set, gas-eng, 0.4-kw, ac, 1-ph, 400-cy, 115-v, 0.08-kw, dc, 28-v, shock, PU-422/O.....	2	2	2	24	22	22
30	J42969	Genr set, gas-eng, 0.5-kw, 60-cy, 1-ph, ac, 120-v, shock.....	10	10	18	10	10	18
31	J43096	Genr set, gas-eng, 0.5-kw, 400-cy, 1- and 3-ph, ac, 120—120/240—120/208-v.....	18	18		18	18	
32	J43233	Genr set, gas-eng, 0.5-kw, 2-wire, dc, 28-v, shock.....	82	82	121	116	116	155
33	J43918	Genr set, gas-eng, 1.5-kw, 60-cy, 1-ph, 2-wire, ac, 120-v, shock.....	55	54	80	83	85	113
34	J44055	Genr set, gas-eng, 1.5-kw, dc, 28-v, shock.....	35	35	30	66	56	64
35	J45699	Genr set, gas-eng, 3-kw, 60-cy, 1—3-ph, 120/240-v, 120/208-v, skid-shock.....	33	33	34	38	40	42
36	J47068	Genr set, gas-eng, 5-kw, 60-cy, 1—3-ph, ac, 120/240—120/208-v, skid-shock mtd.....	38	35	41	49	45	51
37	J74852	Grader, rd, mtg, diesel-driven, hv, 6x4, front-whl steering.....	4	4	4	4	4	4
38	L43664	Launch, M60-ser, tk chassis trans, 40- and 60-ft brg type cl-60.....	4	4	4	16	10	8
39	P96640	Pumping assy, flammable-liq, bulk-trf.....	17	17	22	17	17	22
40	P11462	Ramp-ldg veh, mbl aslt, amph, fitbrg, 39-ft 4-in x 10-ft x 11-ft.....	8	8	8	8	8	8
41	V09730	Tagline crane and crane-shovel, ¾—1-cu yd bucket.....	1	1	1	1	1	1
42	W76816	Trac, FTRAC, low-spd, diesel, mdm dbp, with bulldozer, with scarifier winch.....	8	8	12	8	8	12
43	X48846	Trk, lift, fork, airmbl, 4,000-lb cap.....	3	3	3	3	3	3
44	X48914	Trk, lift, fork, diesel-driven, 6,000-lb cap.....	2	2	1	2	2	1
45	Y35486	Water purification equip set, trk-mtd, diatomite-fl, 1,500-gph (Army).....	5	5	5	5	5	5

Table 1-8. Summary of Divisions' Tactical Vehicles

1	LIN	Nomenclature	3 17G Armd div	Div base		5 7G Inf div	6 Armd div base 6 tk bn (17-35G) 5 inf bn (mech) (7-45G) Chap/Vulc bn (44-325T)		Typical div		8 Inf div base 2 tk bn (17-35G) 8 inf bn (7-15G) Chap/Vulc bn (44-325T)
				4 37G Inf div (mech)	4 37G Inf div (mech)				7 Inf div (mech) base 3 tk bn (17-35G) 7 inf bn (mech) (7-45G) Chap/Vulc bn (44-325T)	7 Inf div (mech) base 3 tk bn (17-35G) 7 inf bn (mech) (7-45G) Chap/Vulc bn (44-325T)	
02	D11401	Carr, comd and recon, armd.....	62	62	50			186	187		68
03	D11538	Carr, CP, lt-tracked.....	63	63	8			140	133		22
04	D12086	Carr, pers, FTRAC, armd.....	81	81	25			410	469		57
05	E02670	Chassis, tlr, GP, 3 1/2-ton, 2-whl, with equip.....	1	1	1			1	1		1
06	E02807	Chassis, tlr, GP, 3 1/2-ton, 2-whl, with equip.....	5	5	5			7	7		7
07	K90188	Inst rep shop, trk-mtd, 2 1/2-ton, 6x6, with equip.....	18	18	18			18	18		18
08	S70243	Stlr, low-bed, wkr, 12-ton, 4-whl, 40-ft, with equip.....	1	1	1			1	1		1
09	S70517	Stlr, low-bed, 25-ton, 4-whl, with equip.....	10	10	14			10	10		14
10	S70791	Stlr, low-bed, 60-ton, 8-whl, with equip.....	0	0	0			0	0		0
11	S72024	Stlr, stake, 12-ton, 4-whl, with equip.....	37	37	38			37	37		38
12	S72983	Stlr, tk, fuel-svc, 5,000-gal, 12-ton, 4-whl, with equip.....	20	20	10			20	20		10
13	S73394	Stlr, tk-transporter, 50-ton, 8-whl, with equip.....	6	6	2			6	6		2
14	S74079	Stlr, van, cgo, 12-ton, 4-whl, with equip.....	9	9	2			9	9		2
15	S74490	Stlr, van, expansible, 6-ton, 4-whl, with equip.....	4	4	4			4	4		4
16	W94030	Tlr, ammo, 1 1/2-ton, 2-whl, with equip.....	117	117	78			137	145		78
17	W94441	Tlr, basic-util, 2 1/2-ton, 2-sgl whl, with equip.....	2	2	38			2	2		38
18	W95263	Tlr, cable-reel, 3 1/2-ton, 2-whl, with equip.....	2	2	2			2	2		2
19	W95400	Tlr, cgo, 1/4-ton, 2-whl, with equip.....	355	346	391			639	647		772
20	W95537	Tlr, cgo, 3/4-ton, 2-whl, with equip.....	290	289	323			408	419		653
21	W95811	Tlr, cgo, 1 1/2-ton, 2-whl, with equip.....	489	483	392			720	679		597
22	W96907	Tlr, flat-bed, 10-ton, 4-whl, with equip.....	1	1	1			1	1		1
23	W98825	Trl, tk, water, 400-gal, 1 1/2-ton, 2-whl, with equip.....	63	63	62			112	108		107
24	X38639	Trk, amb, 1/4-ton, 4x4, with equip.....	4	4	4			37	34		58
25	X38776	Trk, amb, 3/4-ton, 4x4, with equip.....	56	56	57			57	57		58
26	X39735	Trk, cgo, 3/4-ton, 4x4, with equip.....	350	349	366			452	645		714
27	X39872	Trk, cgo, 3/4-ton, 4x4, WWN, with equip.....	80	80	86			141	133		114
28	X39940	Trk, cgo, 1 1/4-ton, 6x6, with equip.....						12	12		12
29	X40009	Trk, cgo, 2 1/2-ton, 6x6, with equip.....	338	326	312			436	416		433
30	X40146	Trk, cgo, 2 1/2-ton, 6x6, WWN, with equip.....	171	180	293			288	263		406
31	X40283	Trk, cgo, 2 1/2-ton, 6x6, XLWB, with equip.....	3	3	3			5	5		5
32	X40831	Trk, cgo, 5-ton, 6x6, LWB, with equip.....	59	59	11			175	148		45
33	X40968	Trk, cgo, 5-ton, LWB, WWN, with equip.....	84	84	59			166	161		89
34	X43845	Trk, dump, 5-ton, 6x6, WWN, with equip.....	22	22	58			22	22		58
35	X56586	Trk, stake, 5-ton, 6x6, WWN, with equip.....	2	2	2			2	2		2
36	X57271	Trk, tk, fuel-svc, 2 1/2-ton, 6x6, with equip.....	22	22	28			28	25		30
37	X57408	Trk, tk, fuel-svc, 2 1/2-ton, 6x6, WWN, with equip.....	2	2	2			2	2		2
38	X59189	Trk, trac, 2 1/2-ton, 6x6, WWN, with equip.....	1	1	1			1	1		1
39	X59326	Trk, trac, 5-ton, 6x6, with equip.....	69	64	52			69	64		52
40	X59463	Trk, trac, 5-ton, 6x6, WWN, with equip.....	1	1	1			1	1		1
41	X59600	Trk, trac, 10-ton, 6x6, with dual midship winch, with high-mtd 5th whl, with equip.....	6	6	2			6	6		2
42	X59874	Trk, trac, 10-ton, 6x6, with midship winch, with low-mtd 5th whl, with equip.....	11	11	15			11	11		15
43	X60696	Trk, trac, wkr, 5-ton, 6x6, WWN, with equip.....	1	1	1			1	1		1
44	X60833	Trk, util, 1/4-ton, 4x4, with equip.....	474	475	511			872	833		978

Table 1-8—Continued

1	LIN	2 Nomenclature	3 17G Armd div	Div base		5 7G Inf div	6 Armd div base 6 tk bn (17-35G) 5 inf bn (mech) (7-45G) Chap/Vulc bn (44-325T)	Typical div		8 Inf div base 2 tk bn (17-35G) 8 inf bn (7-15G) Chap/Vulc bn (44-325T)
				4 37G Inf div (mech)				7 Inf div (mech) base 3 tk bn (17-35G) 7 inf bn (mech) (7-45G) Chap/Vulc bn (44-325T)		
45	X61244	Trk, util, ¼-ton, 4x4, carr for 106-mm rifle, with equip-----						30	42	64
46	X61929	Trk, van, expansible, 2 ½-ton, 6x6, with equip-----	4	4	4		4	4	4	4
47	X62340	Trk, van, shop, 2 ½-ton, 6x6, with equip-----	51	48	66		62	63	75	
48	X62477	Trk, van, shop, 2 ½-ton, 6x6, WWN, with equip-----	4	4	4		6	6	6	6
49	X63299	Trk, wkr, 5-ton, 6x6, WWN, with equip-----	25	29	26		43	43	39	

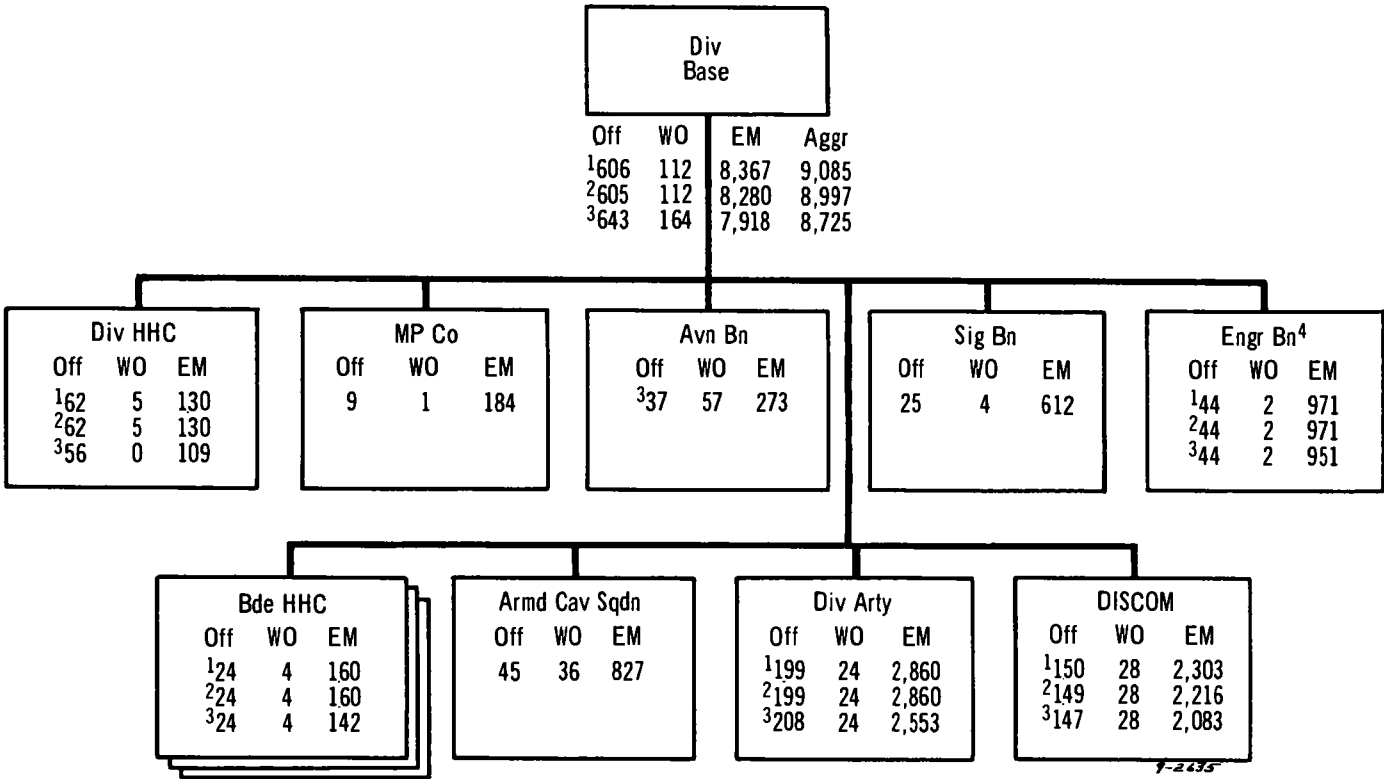
Table 1-9. Summary of Divisions' General Equipment

1	LIN	2 Nomenclature	3 17G Armd div	Div base		5 7G Inf div	6 Armd div base 6 tk bn (17-35G) 5 inf bn (mech) (7-45G) Chap/Vulc bn (44-325T)	Typical div		8 Inf div base 2 tk bn (17-35G) 8 inf bn (7-15G) Chap/Vulc bn (44-325T)
				4 37G Inf div (mech)				7 Inf div (mech) base 3 tk bn (17-35G) 7 inf bn (mech) (7-45G) Chap/Vulc bn (44-325T)		
02	B83582	Bt, brg-erection, inboard-eng, aluminum, gas-driven, 27-ft lg--	0	0	0		0	0	0	0
03	B83856	Bt, ldg, inflatable, aslt-craft, nylon-cloth, 15-man-----	18	18	18		18	18	18	18
04	B84404	Bt, recon, pnew, 3-man-----	32	32	28		32	32	28	
05	J04716	Fuel sys SUPPT, ptbl, 6,000-gal cap-----	1	1	1		1	1	1	1
06	V12141	Tk and pump unit, liq-dispensing, trk-mtg-----	24	24	20		83	76	55	
07	V19950	Tk unit, liq-dispensing, tlr-mtg-----	12	12	8		66	59	38	

1-10. Division Base

Figure 1-7 shows the division base (organic units, exclusive of maneuver battalions) for the armored, infantry, and infantry (mechanized) divisions. Table 1-10 summarizes the weapons and missiles for the major divisional units of these divisions by TOE number, and tables 1-11 through 1-14 show aircraft, group support materiel, ve-

hicles, and general equipment. Personnel and equipment strengths for the division bases (and for the typical divisions) are given for the units when equipped with mobile and assault bridging equipment. The equipment used for M4T6 or class 60 bridging is listed in the tables but no strengths are given.



¹Unit totals when organic to armd div.
²Unit totals when organic to inf div (mech).
³Unit totals when organic to inf div.
⁴Unit tables are for battalion when equipped with MAB bridging; with M4T6 or class 60 bridging, there are 2 more EM.

Figure 1-7. Division base.

Table 1-10. Division Base Units—Weapons and Missiles

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
LIN	Nomenclature	19-27G MP co	1-75G Avn bn	11-35G Sig bn	17-105G Armd cav sqdn	7-4G HHC inf div	17-4G HHC armd div (mech)	37-4G HHC, inf div (mech)	5-145G Engr bn armd or inf div (mech)	5-155G Engr bn inf div	7-42G HHC inf div bde	17-42G HHC, inf div (mech) bde	37-42G HHC inf div (mech) bde	6-100G Inf div arty	6-300G Armd div arty or inf div (mech) arty	29-1G Inf DISCOM	29-11G Inf (mech) DISCOM	29-21G Armd DISCOM
2	A90117 Armt subsys, hel, 7.62-mm mg, lt.....	0	25	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0
3	A90426 Armt subsys, hel, 7.62-mm mg/2.75-in RL, high rate..	0	6	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0
4	A90460 Armt subsys, hel, 40-mm GL..	0	6	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0
5	E56577 Cbt engr veh, FRTAC.....	0	0	0	0	0	0	0	8	4	0	0	0	0	0	0	0	0
6	G02204 Detecting set, mine, AN/PRS-4.....	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1
7	G02341 Detecting set, mine, ptbl, metallic.....	0	0	2	10	0	0	0	49	45	0	0	0	21	24	2	2	1
8	K12718 Hdlg unit, rkt, tlr-mtd, 7.62-mm with equip (HJ)..	0	0	0	0	0	0	0	0	0	0	0	0	8	8	0	0	0
9	K27486 Heating and tie-down unit, 7.62-mm rkt trk-mtd, with equip (HJ).....	0	0	0	0	0	0	0	0	0	0	0	0	8	8	0	0	0
10	K56981 How, hv, SP, 8-in.....	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0
11	K57529 How, towed, 105-mm.....	0	0	0	0	0	0	0	0	0	0	0	0	54	0	0	0	0
12	K57666 How, mdm, SP, 155-mm.....	0	0	0	0	0	0	0	0	0	0	0	0	0	72	0	0	0
13	K57803 How, mdm, towed, 155-mm..	0	0	0	0	0	0	0	0	0	0	0	0	18	0	0	0	0
14	L44575 Lchr, gren, 40-mm.....	16	0	16	108	0	0	0	89	92	11	11	11	117	216	0	0	0
15	L45123 Lchr, rkt, multiple, 115-mm..	0	0	0	0	0	0	0	0	0	0	0	0	9	9	0	0	0
16	L45534 Lchr, rkt, 7.62-mm, trk-mtd, with equip (HJ).....	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0
17	L91975 MG, cal .50, hv-bbl, flex, for gnd use.....	0	0	10	32	2	2	2	0	0	3	3	3	0	0	4	4	4
18	L92386 Mg, 7.62-mm, lt, flex.....	9	6	3	13	0	0	0	15	15	2	5	5	178	181	65	68	67
19	M68282 Mort, 4.2-in, on mount.....	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0
20	M75577 Mount, tripod, mg, hv, cal .50.	0	0	10	32	2	2	2	0	0	3	3	3	0	0	4	4	4
21	M75714 Mount, tripod, mg, 7.62-mm..	9	6	3	13	0	0	0	15	15	2	5	5	178	181	65	68	67
22	N96741 Pistol, cal .45, auto.....	169	2	32	284	29	32	32	161	154	35	41	40	256	354	69	72	71
23	R50543 Recov veh, FTRAC, lt, armd..	0	0	0	5	0	0	0	0	0	0	1	1	1	4	0	0	0
24	R50680 Recov veh, FTRAC, mdm....	0	0	0	0	0	0	0	2	1	0	0	0	0	1	4	4	4
25	R91107 Revolver, cal .38, 2-in bbl....	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	R91244 Revolver, cal .38, 4-in bbl....	0	147	0	68	0	14	14	0	0	4	4	4	16	16	9	11	12
27	R95114 Rifle, 7.62-mm.....	109	218	609	527	131	147	147	752	739	121	132	134	2513	2721	2173	2298	2390
28	R95251 Rifle, 7.62-mm, auto, with bipod.....	34	0	0	26	0	0	0	103	103	6	6	6	0	0	4	10	4
29	R96484 Rifle, rcl, 90-mm.....	9	0	0	0	0	0	0	0	0	2	2	2	0	0	0	0	0
30	U56346 Smg, cal .45.....	0	0	0	38	0	0	0	0	0	0	2	2	0	0	0	0	0
31	V12826 Tk, cbt, FTRAC, 76-mm gun..	0	0	0	27	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 1-11. Division Base Units—Aircraft

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
LIN	Nomenclature	19-27G MP co	1-75G Avn bn	11-35G Sig bn	17-105G Armd cav sqdn	7-4G HHC, inf div	17-4G HHC, armd div	37-4G HHC, inf div (mech)	5-145G Engr bn armd/ inf div (mech)	5-155G Engr bn inf div	7-42G Bde HHC inf div	17-42G HHC, armd div bde	37-42G HHC, inf div (mech) bde	6-100G Inf div arty	6-300G Armd/ inf (mech) div arty	29-1G Inf DISCOM	29-11G Inf (mech) DISCOM	29-21G Armd DISCOM
2	K30645 Hel, obsn, OH-6A.....	0	4	0	9	0	4	4	0	0	4	4	4	9	9	0	0	0
3	K31749 Hel, util, UH-1B.....	0	6	0	11	0	0	0	0	0	0	0	0	2	2	0	0	0
4	K31786 Hel, util, UH-1D.....	0	27	0	6	0	2	2	0	0	0	0	0	0	0	2	2	2

Table 1-12. Division Base Units—Ground Support Materiel

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
LIN	Nomenclature	19-27G MP co	1-75G Avn bn	11-35G Sig bn	17-105G Armd cav sqdn	7-4G HHC, inf div	17-4G HHC, inf div	37-4G HHC, inf div (mech)	5-145G Engr bn, bn,	5-155G Engr bn, inf div	7-42G HHC, inf div bde	17-42G HHC, armd div bde	37-42G HHC, inf div (mech) bde	6-100G Inf div arty	6-300G Armd/ inf div (mech) arty	29-1G Spt comd, inf div	29-11G Spt comd, inf div (mech)	29-21G Spt comd, armd div
2	C20414 Brg, armd veh launch, scissor- type cl-60, aluminum, 60-ft lg span.....		0	0	0	0	0	0	6	6	0	0	0	0	0	0	0	0
3	C25072 Brg, fltg, hwy, aluminum deck balk, superstruc (army).....		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	C25346 Brg, fltg, hwy, cl-60, 135-ft (army).....		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	C25620 Brg, fltg, mbl aslt, amph, 36-ft 1-in lg, 10-ft wide, 10-ft 4-in high.....		0	0	0	0	0	0	16	16	0	0	0	0	0	0	0	0
6	C25757 Brg, fltg, raft sec, lt, tac.....		0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0
7	C26305 Brg, erection set, fltg brg, cl-60, steel-aluminum deck, balk, superstruc.....		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	C29490 Bucket, clamshell, ¾-cu yd.....		0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0
9	C30997 Bucket, dragline, ¾-cu yd.....		0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
10	E69242 Compressor, recip, pwr-driven, air recp, gas driven, 15-cfm, 175-psi.....		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	E70064 Compressor, recip, pwr-driven, trk, 2-whl, pneu tires, gas- driven, 5-cfm, 175-psi.....		1	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0
12	E73626 Compressor, rot, pwr-driven, air, wheelbarrow frame, 2 pneu tires, gas-driven, 60-cfm, 6.5-psi.....		0	0	0	0	0	0	2	2	0	0	0	0	0	6	6	3
13	F39241 Crane-shovel, whl-mtd, 5-ton, ¾-cu yd, diesel, 4x4, rough terrain, airtrans.....		0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4
14	F39378 Crane, whl-mtd, 20-ton, ¾-cu yd, rough terrain.....		0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0
15	G69235 Drum, hdlg atch, forklift trk, chime ring hook.....		0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
16	H32869 Fairlead roller and sheave, 12 ½-ton crane-shovel crawler, 20-ton crane-shovel truck.....		0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
17	H38787 Ferry, conversion set, raft, inf spt		0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0

Table 1-12—Continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
LIN	Nomenclature	19-27G MP co	1-75G Avn bn	11-35G Sig bn	17-105G Armd cav sqdn	7-4G HHC, inf div	17-4G HHC, inf div	37-4G HHC, inf div (mech)	5-145G Engr bn,	5-155G Engr bn, inf div	7-42G HHC, inf div bde	17-42G HHC, armd div bde	37-42G HHC, inf div (mech) bde	6-100G Inf div arty	6-300G Armd/ inf div (mech) arty	29-1G Spt comd, inf div	29-11G Spt comd, inf div (mech)	29-21G Spt comd, armd div
18	J35561 Genr set, diesel-eng, tlr-mtd, 45-kw, 60-cy, 3-ph, ac, 120/208 240/416-v, PU-407/M-----	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	J53698 Genr set, diesel-eng, trk-mtd, 45-kw, 60-cy, 3-ph, ac, 120/208 240/416-v, PU-408M-----	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	J35835 Genr set, diesel-eng, 15-kw, 60-cy, 3-ph, ac, 120/208 240/416-v skid-----	0	0	0	0	2	2	2	0	0	0	0	0	0	0	1	1	1
21	J36109 Genr set, diesel-eng, 30-kw, 60-cy, 3-ph, ac, 120/208 240/416-v, 50-cy, skid-----	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
22	J41178 Genr set, gas-eng, tlr-mtd, PU-290/MR-----	0	0	3	0	0	0	0	0	0	0	0	0	0	0	16	18	18
23	J41315 Genr set, gas-eng, tlr-mtd, PU-294/G-----	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1
24	J41589 Genr set, gas-eng, tlr-mtd, PU-322/G-----	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	J41931 Genr set, gas-eng, tlr-mtd, PU-456/G-----	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	J42274 Genr set, gas-eng, 0.15-kw, 60-cy, 1-ph, ac, 120-v, skid----	0	0	0	0	0	0	1	0	0	0	0	0	0	20	0	0	0
27	J42685 Genr set, gas-eng, 0.3-kw, ac, 115-v, 1-ph, 400-cy, dc, 24-35-v-----	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0
28	J42822 Genr set, gas-eng, 0.4-kw, ac, 1-ph, 400-cy, 115-v, 0.08-kw, dc, 28-v shock, PU-422U-----	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
29	J42959 Genr set, gas-eng, 0.5-kw, 60-cy, 1-ph, ac, 120-v shock-----	0	6	0	0	0	0	0	0	0	0	0	0	9	7	3	3	3
30	J43096 Genr set, gas-eng, 0.5-kw, 400-cy, 1- and 3-ph, ac, 120 120/240 120/208-v-----	0	0	0	0	0	0	0	0	0	0	0	0	0	18	0	0	0
31	J43233 Genr set, gas-eng, 0.5-kw, 2-wire, dc, 28-v shock-----	7	0	0	0	0	0	0	0	0	0	0	0	92	53	22	22	22
32	J43918 Genr set, gas-eng, 1.5-kw, 60-cy, 1-ph, 2-wire, ac, 120-v shock----	1	2	2	4	2	1	1	2	6	2	0	0	18	6	39	38	39
33	J44055 Genr set, gas-eng, 1.5-kw, dc, 28-v shock-----	0	2	0	9	0	0	0	9	9	1	2	2	2	2	5	9	9
34	J45699 Genr set, gas-eng, 3-kw, 60-cy, 1-3-ph, 120/240-v 120/208-v, skid, shock-----	0	0	0	2	0	0	0	19	14	2	2	2	8	1	4	5	5
35	J47068 Genr set, gas-eng, 5-kw, 60-cy, 1-3-ph, ac, 120-240-120/ 208-v, skid-shock mtd-----	0	1	0	1	3	3	3	0	1	0	0	0	2	2	33	29	32
36	J74852 Grader, rd, mtg, diesel-driven, hv, 6x4, front-whl steering----	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0

Table 1-12—Continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
LIN	Nomenclature	19-27G MP co	1-75G Avn bn	11-35G Sig bn	17-105G Armd cav sqdn	7-4G HHC, inf div	17-4G HHC, inf div	37-4G HHC, inf div (mech)	5-145G Engr bn,	5-155G Engr bn, inf div	7-42G HHC, inf div bde	17-42G HHC, armd div bde	37-42G HHC, inf div (mech) bde	6-100G Inf div arty	6-300G Armd/ inf div (mech) arty	29-1G Spt comd, inf div	29-11G Spt comd, inf div (mech)	29-21G Spt comd, armd div
37	L43664 Lcbv, M60-series, tk chassis, trans, 40- and 60-ft brg, type cl-60.....	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0
38	P11866 Pneu tool and compressor outfit, 250-cfm, tlr-mtd.....	0	0	0	0	0	0	0	5	5	0	0	0	0	0	0	0	0
39	P96640 Pumping assy, flammable liq, bulk trf.....	0	8	0	2	0	1	1	0	0	1	1	1	1	1	8	10	10
40	R11462 Ramp, loading, veh, mbl aslt, amph fit brg, 39-ft 4 in x 10 ft x 11 ft.....	0	0	0	0	0	0	0	8	8	0	0	0	0	0	0	0	0
41	V09730 Tagline crane and crane-sbovel, ¾—1-cu yd bucket.....	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
42	W76816 Trac, FTRAC, low-spd, diesel, mdm dbp, with bulldozer with scarifier winch.....	0	0	0	0	0	0	0	8	12	0	0	0	0	0	0	0	0
43	X48846 Trk, lift, fork, airmbl, 4,000-lb cap.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3
44	X48914 Trk, lift, fork, diesel-driven, 6,000-lb cap.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2
45	Y35486 Water purification equip set, trk-mtd, diatomite fl, 1,500-gph (army).....	0	0	0	0	0	0	0	5	5	0	0	0	0	0	0	0	0

Table 1-13. Division Base Units—Tactical Vehicles

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
LIN	Nomenclature	19-27G MP co	1-75G Avn bn	11-35G Sig bn	17-105G Armd cav sqdn	7-4G HHC, inf div	17-4G HHC, inf div	37-4G HHC, inf div (mech)	5-145G Engr bn	5-155G Engr bn, inf div	7-42G HHC, inf div bde	17-42G HHC, armd div bde	37-42G HHC, inf div (mech) bde	6-100G Inf div arty	6-300G Armd/ inf div (mech) arty	29-1G Spt comd, inf div	29-11G Spt comd, inf div (mech)	29-21G Spt comd, armd div
2	D11401 Carr, comd and recon, armd.....	0	0	0	50	0	3	3	0	0	0	3	3	0	0	0	0	0
3	D11538 Carr, CP, lt-tracked.....	0	0	0	6	0	2	2	0	0	0	6	6	2	37	0	0	0
4	D12086 Carr, pers, FTRAC, armd.....	0	0	0	25	0	0	0	44	0	0	4	4	0	0	0	0	0
5	E02670 Chassis, tlr, GP, 3 ½-ton, 2-whl, with equip.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
6	E02807 Chassis, tlr, genr, 2 ½-ton, 2-whl, with equip.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	5
7	K90188 Inst rep shop, trk-mtd, 2 ½-ton, 6x6, with equip.....	0	0	3	0	0	0	0	0	0	0	0	0	0	0	15	15	15
8	S70243 Stlr, low-bed, wkr, 12-ton, 4-whl, 40-ft, with equip.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
9	S70517 Stlr, low-bed, 25-ton, 4-whl with equip.....	0	0	0	0	0	0	0	10	14	0	0	0	0	0	0	0	0
10	S70791 Stlr, low-bed, 60-ton, 8-whl, with equip.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	S72024 Stlr, stake, 12-ton, 4-wbl, with equip.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	37	37

Table 1-13—Continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
LIN	Nomenclature	19-27G MP co	1-75G Avn bn	11-35G Sig bn	17-105G Armd cav sqdn	7-4G HHC, inf div	17-4G HHC, inf div	37-4G HHC, inf div (mech)	5-145G Engr bn	5-155G Engr bn, inf div	7-42G HHC, inf div bde	17-42G HHC, armd div bde	37-42G HHC, inf div (mech) bde	6-100G Inf div arty	6-300G Armd/ inf div (mech) arty	29-1G Spt comd, inf div	29-11G Spt comd, inf div (mech)	29-21G Spt comd, armd div
12	S72983 Stlr tk, fuel-svc, 5,000-gal, 12-ton, 4-whl with equip-----	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	20	20
13	S73394 Stlr, tk, transporter, 50-ton, 8-whl, with equip-----	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	6
14	S74079 Stlr, van, cgo, 12-ton, 4-whl, with equip-----	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	9	9
15	S74490 Stlr, van, expandible, 6-ton, 4-whl, with equip-----	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4
16	W94030 Tlr, ammo, 1 1/2-ton, 2-whl, with equip-----	0	0	0	2	0	0	0	3	0	0	0	0	76	112	0	0	0
17	W94441 Tlr, basic, util, 2 1/2-ton, 2 sgl whl, with equip-----	0	0	0	0	0	0	0	2	38	0	0	0	0	0	0	0	0
18	W95263 Tlr, cable reel, 3 1/2-ton, 2-whl, with equip-----	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0
19	W95400 Tlr, 1/4-ton, 2-whl, with equip-----	45	9	20	14	20	21	19	40	40	19	15	12	104	85	82	87	85
20	W95537 Tlr, cgo, 3/4-ton, 2-whl, with equip	6	20	48	10	4	5	5	12	17	11	9	9	133	121	52	60	61
21	W95811 Tlr, cgo, 1 1/2-ton, 2-whl, with equip-----	2	22	10	19	13	11	10	39	41	6	5	5	67	67	200	321	326
22	W96907 Tlr, flat-bed, 10-ton, 4-whl, with equip-----	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
23	W98825 Tlr, tk, water, 400-gal, 1 1/2-ton, 2-whl, with equip-----	1	2	3	5	1	1	1	6	6	1	1	1	22	25	19	19	19
24	X38639 Trk, amb, 1/4-ton, 4x4, with equip	0	0	0	3	0	0	0	1	1	0	0	0	0	0	0	0	0
25	X38776 Trk, amb, 3/4-ton, 4x4, with equip	0	1	0	0	2	2	2	0	0	0	0	0	6	6	48	48	48
26	X39735 Trk, cgo, 3/4-ton, 4x4, with equip	6	17	73	11	5	6	6	18	23	12	11	11	130	130	65	72	73
27	X39872 Trk, cgo, 3/4-ton, 4x4, WWN, with equip-----	0	6	1	3	0	0	0	0	0	1	1	1	69	69	4	4	4
28	X39940 Trk, cgo, 1 1/4-ton, 6x6, with equip	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	X40009 Trk, cgo, 2 1/2-ton, 6x6, with equip	1	5	25	9	4	4	4	29	29	3	4	4	64	67	166	179	191
30	X40146 Trk, cgo, 2 1/2-ton, 6x6, WWN, with equip-----	2	7	60	14	3	1	1	13	16	1	1	1	151	49	37	38	29
31	X40283 Trk, cgo, 2 1/2-ton, 6x6, XLWB, with equip-----	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1	1
32	X40831 Trk, cgo, 5-ton, 6x6, LWB, with equip-----	0	0	0	11	0	0	0	0	0	0	0	0	0	48	0	0	0
33	X40968 Trk, cgo, 5-ton, 6x6, LWB, WWN, with equip-----	0	0	0	9	0	0	0	0	0	0	0	0	50	75	0	0	0
34	X43845 Trk, dump, 5-ton, 6x6, WWN, with equip-----	0	0	0	0	0	0	0	22	58	0	0	0	0	0	0	0	0
35	X56586 Trk, stake, 5-ton, 6x6, WWN, with equip-----	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0
36	X57271 Trk, tk, fuel-svc, 2 1/2-ton, 6x6, with equip-----	0	10	0	4	0	1	1	0	0	1	1	1	1	1	10	13	13
37	X57408 Trk, tk, fuel-svc, 2 1/2-ton, 6x6, WWN, with equip-----	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	X59189 Trk, trac, 2 1/2-ton, 6x6, WWN, with equip-----	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1

Table 1-13—Continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
LIN	Nomenclature	19-27G MP co	1-75G Avn bn	11-35G Sig bn	17-105G Armd cav sqdn	7-4G HHC, inf div	17-4G HHC, inf div	37-4G HHC, inf div (mech)	5-145G Engr bn	5-155G Engr bn, inf div	7-42G HHC, inf div bde	17-42G HHC, armd div bde	37-42G HHC, inf div (mech) bde	6-100G Inf div arty	6-300G Armd/ inf div (mech) arty	29-1G Spt comd, inf div	29-11G Spt comd, inf div (mech)	29-21G Spt comd, armd div
39	X59826 Trk, trac, 5-ton, 6x6, with equip.	0	0	0	0	0	0	0	1	1	0	0	0	0	0	51	63	68
40	X59463 Trk, trac, 5-ton, 6x6, WWN, with equip.-----	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
41	X59600 Trk, trac, 10-ton, 6x6, with dual midship winch, with high-mtd 5th whl, with equip.-----	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	6
42	X59874 Trk, trac, 10-ton, 6x6, with midship winch, with low-mtd 5th whl, with equip.-----	0	0	0	0	0	0	0	11	15	0	0	0	0	0	0	0	0
43	X60696 Trk, trac, wkr, 5-ton, 6x6, WWN, with equip.-----	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
44	X60833 Trk, util ¼-ton, 4x4, with equip.	45	10	26	31	24	27	27	40	40	22	18	18	179	158	90	94	98
45	X61929 Trk, van, shop, 2 ½-ton, 6x6, with equip.-----	0	0	0	0	4	4	4	0	0	0	0	0	0	0	0	0	0
46	X62340 Trk, van, shop, 2 ½-ton, 6x6, with equip.-----	0	5	0	1	4	4	4	1	1	2	0	0	14	10	35	32	35
47	X62477 Trk, van, shop, 2 ½-ton, 6x6, WWN, with equip.-----	0	0	0	0	0	0	0	0	0	0	0	0	3	3	1	1	1
48	X63299 Trk, wkr, 5-ton, 6x6, WWN, with equip.-----	0	1	1	3	0	0	0	1	1	1	0	0	9	9	8	15	11

Table 1-14. Division Base Units—General Equipment

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
LIN	Nomenclature	19-27G MP co	1-75G Avn bn	11-35G Sig bn	17-105G Armd cav sqdn	7-4G HHC, inf div	17-4G HHC armd div	37-4G HHC, inf div (mech)	5-145G Engr bn armd or inf div (mech)	5-155G Engr bn inf div	7-42G HHC inf div bde	17-42G HHC, armd div bde	37-42G HHC inf div (mech) bde	6-100G Inf div arty	6-300G Armd div arty or inf div (mech) arty	29-1G HHC DISCOM	29-11G Inf (mech) DISCOM	29-21G Armd DISCOM	7-G Inf div
2	B83582 Bt, brg-erection, inboard-eng, aluminum, gas-driven, 27-ft lg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	B83856 Bt, ldg, inflatable, aslt cft, nylon cloth, 15-man-----	0	0	0	0	0	0	0	18	18	0	0	0	0	0	0	0	0	36
4	B84404 Bt, recon, pneu, 3-man-----	0	0	0	0	0	0	0	32	28	0	0	0	0	0	0	0	0	60
5	J04716 Fuel sys, SUPPT, pthl, 6,000- gal cap.-----	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	3
6	V12141 Tk and pump unit, liq- dispensing, trk-mtg-----	0	0	0	5	0	0	0	6	6	0	0	0	7	11	2	2	2	41
7	V19950 Tk unit, liq-dispensing, tlr-mtg	0	0	0	0	0	0	0	6	6	0	0	0	2	6	0	0	0	20

1-11. Airmobile Division

Figure 1-8 shows the organization of the airmobile division, and tables 1-15 through 1-19

show the weapons and missiles, aircraft, ground support materiel, vehicles, and general equipment.

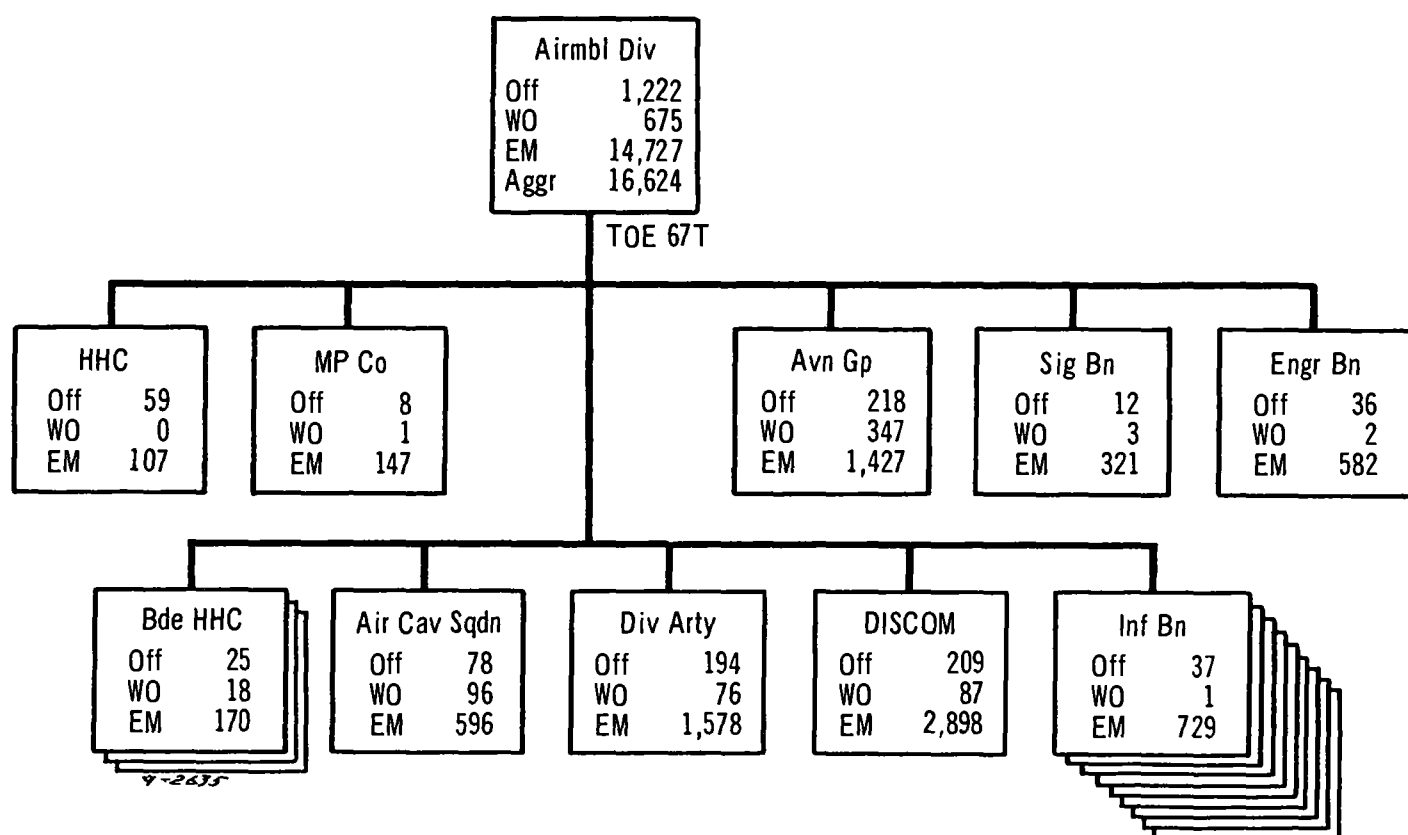


Figure 1-8. The airmobile division.

Table 1-15. Airmobile Division—Weapons and Missiles

1	2	3	4	5	6	7	8	9	10	11	12	13
LIN	Nomenclature	67-2T HHC, airmbl div	19-87T MP co	1-100T Avn gp	11-205T Sig bn	5-215T Engr bn	67-42T Bde HHC	17-95T Armd cav sqdn	6-700T Div arty	29-41T DISCOM	7-55T Inf bn	67-T Airmbl div total
2	A90117 Armt, subsys, hel, 7.62-mm mg, lt.....	0	0	124	0	0	5	50	0	5	0	194
3	A90122 Armt, subsys, hel, 7.62-mm mg, door-mtd, lt wt.....	0	0	48	0	0	0	0	0	0	0	48
4	A90154 Armt, subsys, hel, 7.62-mm mg, high rate.....	0	0	19	0	0	8	0	16	4	0	63
5	A90391 Armt, subsys, hel, 7.62-mm mg, 2.75-in RL.....	0	0	30	0	0	0	0	7	0	0	37
6	A90426 Armt, subsys, hel, 7.62-mm mg, 2.75-in RL, high rate.....	0	0	0	0	0	0	38	0	0	0	38
7	A90597 Armt, subsys, hel, 2.75-in RL.....	0	0	0	0	0	0	0	36	0	0	36
8	G02204 Detecting set, mine, AN/PRS-4.....	0	0	0	0	29	0	0	0	0	0	29
9	G02341 Detecting set, mine, ptbl, metallic.....	0	0	0	0	29	0	4	15	0	3	75
10	G02478 Detecting set, mine, trk-mtd.....	0	0	0	0	1	0	0	0	0	0	1
11	H68063 Flamethrower, ptbl.....	0	0	0	0	0	2	0	0	0	0	2
12	K57392 How, lt towed, 105-mm.....	0	0	0	0	0	0	0	54	0	0	54
13	L44575 Lchr, gren, 40-mm.....	0	13	70	31	32	15	215	42	109	86	1331
14	L45260 Lchr, rkt, 3.5-in.....	0	0	2	0	0	0	0	0	35	0	37
15	L91975 Mg, cal .50, hv-bbl, flex, for gnd use.....	0	0	0	0	0	0	0	0	4	0	4
16	L92386 Mg, 7.62-mm, lt, flex.....	2	8	50	2	38	6	37	106	80	20	521
17	M68008 Mort, 81-mm, on mount.....	0	0	0	0	0	0	3	0	0	13	120
18	M75577 Mount, tripod, mg, hv, cal .50.....	0	0	0	0	0	0	0	0	4	0	4
19	M75714 Mount, tripod, mg, 7.62-mm.....	2	8	2	2	38	6	27	0	80	20	357
20	N96741 Pistol, cal .45, auto.....	43	121	103	39	83	42	307	180	193	235	3310
21	R91107 Revolver, cal .38, 2-in bbl.....	0	2	0	0	0	0	0	0	0	0	2
22	R91244 Revolver, cal .38, 4-in bbl.....	0	0	807	0	0	32	193	154	118	0	1368
23	R94977 Rifle, 5.56-mm, with bipod.....	112	115	1079	295	536	270	280	1002	2748	4122	11522
24	R96484 Rifle, rcl, 90-mm.....	0	4	0	0	0	0	0	0	0	18	166
25	R96758 Rifle, rcl, 106-mm, on mount.....	0	0	0	0	0	0	6	0	0	8	78

Table 1-16. Airmobile Division—Aircraft

1	2	3	4	5	6	7	8	9	10	11	12	13
LIN	Nomenclature	67-2T Div HHC	19-87T MP co	1-100T Avn gp	11-205T Sig bn	5-215T Engr bn	67-42T Bde HHC	17-95T Cav sqdn	6-700T Div arty	29-41T DISCOM	7-55T Inf bn	67 Total
2	A30221 Airplane, obsn, OV-18.....	0	0	3	0	0	0	0	0	0	0	3
3	A30271 Airplane, obsn, STOL, OV-1C.....	0	0	3	0	0	0	0	0	0	0	3
4	K30378 Hel, cgo, trans, CH-47A.....	0	0	48	0	0	0	0	0	0	0	48
5	K30645 Hel, obsn, OH-6A.....	0	0	19	0	0	8	30	16	4	0	93
6	K31749 Hel, util, UH-1B.....	0	0	30	0	0	0	38	43	0	0	111
7	K31786 Hel, util, UH-1D.....	0	0	124	0	0	5	20	0	17	0	176

Table 1-17. Airmobile Division—Ground Support Materiel

1	2	3	4	5	6	7	8	9	10	11	12	13
LIN	Nomenclature	67-2T HHC	19-87T MP co	1-100T Avn gp	11-205T Sig bn	5-21T Engr bn	67-42T Bde HHC	17-95T Armd cav sqdn	6-700T Div arty	29-41T DISCOM	7-55T Inf bn	67-T Airmbl div total
2	E68694 Compressor, recip, pwr-driven, air, recip, ac, 208-416-v, 60-cy, 3-ph, 15 cfm, 175 psi.....	0	0	0	0	0	0	0	0	1	0	1
3	F69105 Compressor, recip, pwr-driven, air, recip, gas- driven, 5-cfm, 175-psi.....	0	0	0	0	0	0	0	0	7	0	7
4	F70817 Compressor, recip, pwr-driven, air, whl, gas- driven, 4-cfm, 3,000 psi.....	0	0	1	0	0	0	3	0	0	0	4
5	F39172 Crane, whl-mtd, 3-ton.....	0	0	0	0	2	0	0	0	9	0	11
6	F43077 Crane, whl-mtd, 7-ton, with boom crane, 24-ft, with block and tackle.....	0	0	0	0	0	0	0	0	1	0	1
7	G69235 Drum, hdlg, atch, forklift trk, chime ring hook.....	0	0	0	0	0	0	0	0	2	0	2
8	H56391 Fftg equip set, trk-mtd, AACFT, crash, os, cl 530 B.....	0	0	1	0	0	0	0	0	0	0	1
9	J35835 Genr set, diesel-eng, 15-kw, 60-cy, 3-ph, ac, 120/208—240/416-v skid.....	2	0	0	0	0	0	0	0	5	0	7
10	J36109 Genr set, diesel-eng, 30-kw, 60-cy, 3-ph, ac, 120/208—240/416-v, 50-cy, skid.....	0	0	0	0	0	0	0	0	1	0	1
11	J42959 Genr set, gas-eng, 0.5-kw, 60-cy 1-ph, ac, 120-v, shock.....	0	0	0	0	0	0	0	1	0	0	1
12	J43233 Genr set, gas-eng, 0.5-kw, 2-wire, dc, 28-v, shock.....	0	0	0	0	0	0	0	2	3	0	5
13	J43918 Genr set, gas-eng, 1.5-kw, 60-cy, 1-ph, 2-wire, ac, 120-v, shock.....	0	1	0	0	2	0	7	17	14	0	41
14	J44055 Genr set, gas-eng, 1.5-kw, dc, 28-v, shock.....	0	5	5	0	0	0	12	22	10	0	54
15	J45699 Genr set, gas-eng, 3-kw, 60-cy, 1—3-ph, 120/240-v 120/208-v, skid-shock.....	0	0	29	10	6	7	0	7	21	1	103
16	J46178 Genr set, gas-eng, 3-kw, dc, 28-v, whl-mtd.....	0	0	0	0	0	0	2	0	0	0	2
17	J47068 Genr set, gas eng, 5-kw, 60-cy, 1—3-ph, ac, 120—240—120/208-v, skid-shock mtd.....	0	0	12	0	5	0	0	1	62	0	80
18	J48987 Genr set, gas-eng, 5-kw, dc, 120-v, skid.....	0	0	0	0	0	0	0	0	2	0	2
19	J49055 Genr set, gas-eng, 7.5-kw, dc, 28.5-v, whl-mtd.....	0	0	0	0	0	0	3	0	0	0	3
20	J49261 Genr set, gas-eng, 10-kw, 400-cy, 1—3-ph to ac, 120—120/208 v, skid.....	0	0	1	0	0	0	0	0	0	0	1
21	J74886 Grader, rd, mtg, diesel driven, sectionalized.....	0	0	0	0	6	0	0	0	0	0	6
22	J75239 Grader scraper atch, for grader rd.....	0	0	0	0	4	0	0	0	0	0	4
23	L76693 Loader, scoop type sec, 2 ½-cu yd.....	0	0	0	0	2	0	0	0	0	0	2
24	P90591 Pump, cntrf, gas-driven, base-mtd, 1 ½-in, 30—40 gpm.....	3	0	152	1	6	6	90	15	2	0	287
25	P90610 Pump cntrf, gas-driven, base-mtd, 1 ½-in, 100-gpm.....	0	0	64	0	0	0	0	0	44	0	108
26	P96640 Pumping assy, flammable liq, bulk trf.....	0	0	19	0	0	0	0	0	0	0	19
27	S10657 Roller, airmbl, sgl drum.....	0	0	0	0	3	0	0	0	0	0	3
28	S10682 Roller, airmbl, vibrating.....	0	0	0	0	3	0	0	0	0	0	3
29	S11684 Roller, mtg, pneu-tired, airmbl, 9-whl.....	0	0	0	0	2	0	0	0	0	0	2
30	S12575 Roller, towed, sheepsfoot, 2-door.....	0	0	0	0	2	0	0	0	0	0	2
31	S56119 Scraper, airmbl, sectionalized.....	0	0	0	0	4	0	0	0	0	0	4
32	T10138 Shop equip, contact maint, trk-mtd.....	0	0	0	0	3	0	0	0	0	0	3

Table 1-17—Continued

1 LIN	2 Nomenclature	3 67-2T HHC	4 19-87T MP co	5 1-100T Avn gp	6 11-205T Sig bn	7 5-215T Engr bn	8 67-42T Bde HHC	9 17-95T Armd cav sqdn	10 6-700T Div arty	11 29-41T DISCOM	12 7-55T Inf bn	13 67-T Airmbl div total
33	W76200 Trac, airmbl, 4x4.....	0	0	0	0	4	0	0	0	0	0	4
34	W76268 Trac, FTRAC, low-spd, mdm, dbp, sectionalized, air-trans, with atch.....	0	0	0	0	4	0	0	0	0	0	4
35	W76302 Trac, airmbl, with backhoe and front loader, ½ cu yd.....	0	0	0	0	3	0	0	0	0	0	3
36	W76336 Trac, airmbl, with blade.....	0	0	0	0	6	0	0	0	0	0	6
37	W89557 Trac, whl, whs, gas, 4,000-lb.....	0	0	0	0	0	0	0	0	2	0	2
38	X48846 Trk, lift, fork, airmbl, 4,000-lb cap.....	0	0	0	0	0	0	0	0	1	0	1
39	X49051 Trk, lift, fork, diesel-driven, 10,000-lb cap.....	0	0	0	0	0	0	0	0	1	0	1
40	X52818 Trk, lift, fork, rough terrain, 3,000-lb.....	1	0	1	0	1	0	0	0	34	0	37
41	Y35143 Water purification equip set, diatomite fil, 420 gph.....	0	0	1	0	0	0	0	0	0	0	1
42	Y36239 Water purification set, ptbl, 600-gph.....	0	0	0	0	5	0	0	0	0	0	5

Table 1-18. Airmobile Division—Tactical Vehicles

1 LIN	2 Nomenclature	3 67-2T HHC	4 19-87T MP co	5 1-100T Avn gp	6 11-205T Sig bn	7 5-215T Engr bn	8 67-42T Bde HHC	9 17-95T Armd cav sqdn	10 6-700T Div arty	11 29-41T DISCOM	12 7-55T Inf bn	13 67-T Airmbl div total
2	F02807 Chassis, tir, genr, 2 ½-ton, 2-whl, with equip....	2	0	0	0	0	0	0	0	5	0	7
3	G02478 Detecting set, mine, trk-mtd.....	0	0	0	0	1	0	0	0	0	0	1
4	G34815 Dolly set, left, trans shelter, 5 ¼-ton, with equip.....	0	0	3	0	3	0	1	0	51	0	58
5	S55393 Scooter, mtr, rough terrain, 3-whl, with equip..	4	9	26	0	4	3	0	6	14	2	90
6	S55400 Scooter, mtr, rough terrain, 3-whl, with equip..	0	0	2	0	0	0	0	0	0	0	2
7	S72024 Stlr, stake, 12-ton, 4-whl, with equip.....	0	0	0	0	0	0	0	0	1	0	1
8	S74490 Stlr, van, expansible, 6-ton, 4-whl, with equip..	0	0	0	0	0	0	0	0	4	0	4
9	W93961 Tlr, acft, cgo loading-unloading, 3 ½-ton 4-whl, with equip.....	0	0	0	0	0	0	0	0	43	0	43
10	W94441 Tlr, basic, util, 2 ½-ton, 2 sgl whl, with equip..	0	0	0	0	2	0	0	0	0	0	2
11	W95400 Tlr, cgo, ¼-ton, 2-whl, with equip.....	16	13	60	56	33	16	29	90	113	9	539
12	W95537 Tlr, cgo, ¾-ton, 2-whl, with equip.....	10	4	117	6	15	7	33	34	93	2	351
13	W95811 Tlr, cgo, 1 ½-ton, 2-whl, with equip.....	2	0	31	0	3	0	6	7	27	0	76
14	W96701 Tlr, flat-bed, tilt-loading, 6-ton, 4-whl, with equip.....	0	0	0	0	9	0	0	0	0	0	9
15	W97866 Tlr, oxy-svc, 3-whl.....	0	0	1	0	0	0	0	0	0	0	1
16	W98270 Tlr, platform, whs, 6,000-lb.....	0	0	63	0	0	0	0	0	6	0	69
17	W98619 Tlr, stake and platform, util, ¾-ton, 4-whl, with equip.....	0	0	0	0	0	0	0	4	0	0	4
18	W98825 Tlr, tk, water, 400-gal, 1 ½-ton, 2-whl, with equip.....	1	0	4	1	1	0	5	9	5	0	26
19	X38639 Trk, amb, ¼-ton, 4x4, with equip.....	0	0	3	0	1	0	2	1	12	0	19
20	X39735 Trk, cgo, ¾-ton, 4x4, with equip.....	12	4	117	0	13	2	3	34	70	0	259
21	X39872 Trk, cgo, ¾-ton, 4x4, WWN, with equip.....	0	0	5	7	0	6	33	36	30	2	147
22	X40009 Trk, cgo, 2 ½-ton, 6x6, with equip.....	2	0	31	0	0	0	0	16	41	0	90
23	X40146 Trk, cgo, 2 ½-ton, 6x6, WWN, with equip.....	1	0	7	0	0	0	11	0	10	0	29

Table 1-18—Continued

1	2	3	4	5	6	7	8	9	10	11	12	13
LIN	Nomenclature	67-2T HHC	19-87T MP co	1-100T Avn gp	11-205T Sig bn	5-21T Engr bn	67-42T Bde HHC	17-95T Armd cav sqdn	6-700T Div arty	29-41T DISCOM	7-55T Inf bn	67-T Airmbl div total
24	X40420 Trk, cgo, 2 ½-ton, 6x6, XLWW, WWN, with equip.....	0	0	0	0	1	0	0	0	0	0	1
25	X43228 Trk, dump, ¾-ton, 4x4, with equip.....	0	0	0	0	42	0	0	0	0	0	42
26	X43297 Trk, dump, 2 ½-ton, 6x6, with equip.....	0	0	0	0	15	0	0	0	0	0	15
27	X55627 Trk, platform, util, ½-ton, 4x4, with equip....	0	3	24	0	0	6	10	26	77	19	329
28	X57408 Trk, tk, fuel-svc, 2 ½-ton, 6x6, WWN, with equip.....	0	0	14	0	0	1	4	4	5	0	30
29	X59326 Trk, trac, 5-ton, 6x6, with equip.....	0	0	0	0	0	0	0	0	1	0	1
30	X60833 Trk, util, ¼-ton, 4x4, with equip.....	20	26	92	75	33	17	47	90	113	5	592
31	X61244 Trk, util, ¼-ton, carr for 106-mm rifle, with equip.....	0	0	0	0	0	0	6	0	0	8	78
32	X63094 Trk, wkr, 2 ½-ton, 4x4, with equip.....	0	0	0	0	1	0	0	0	5	0	6
33	X63162 Trk, wkr, 2 ½-ton, 6x6, WWN, with equip.....	0	0	0	0	0	0	1	0	2	0	3
34	Z90492 Tlr, flat-bed, 12-ton, tilt-bed, tri-axle.....	0	0	0	0	8	0	0	0	0	0	8

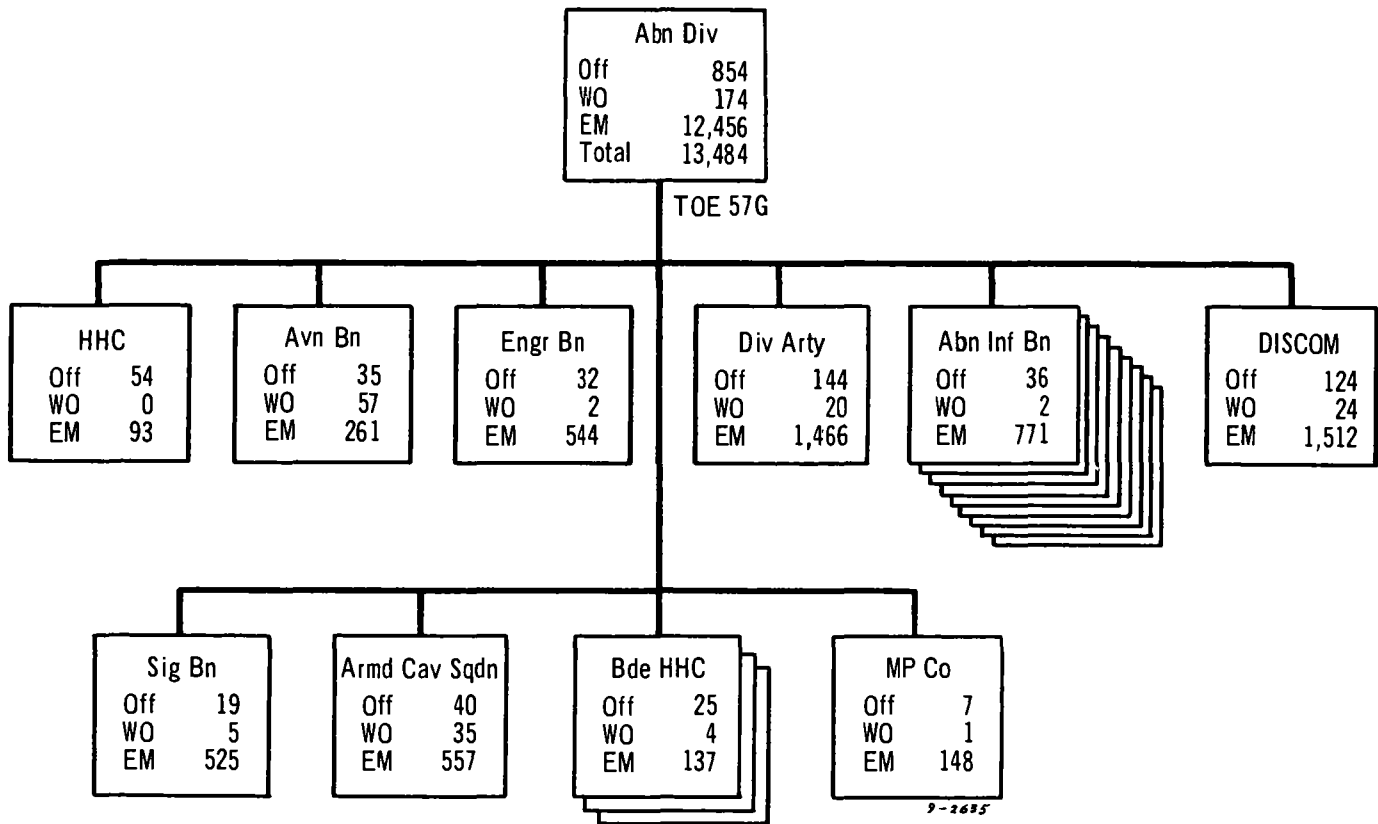
Table 1-19. Airmobile Division—General Equipment

1	2	3	4	5	6	7	8	9	10	11	12	13
LIN	Nomenclature	67-2T Div HHC	19-87T MP co	1-100T Avn gp	11-205T Sig bn	5-215T Engr bh	67-42T Bde HHC	17-59T Cav sqdn	6-700T Div arty	29-41T DISCOM	7-55T Inf bn	67 Total
2	B84404 Bt, recon, pneu, 3-man.....	0	0	0	0	2	0	0	0	0	0	2
3	H48568 Fil, meter-module, with flow dividers and hose assy.....	0	0	0	0	0	0	0	0	44	0	44
4	J04716 Fuel sys, SUPP, ptbl, 6,000—gal cap.....	0	0	0	0	0	0	0	0	2	0	2
5	M66293 Monitor, liq-fuel contam, 50-gpm.....	0	0	2	0	0	0	0	0	5	0	7
6	M66303 Monitor, liq-fuel contam, 400-gpm.....	0	0	12	0	0	0	0	0	0	0	12
7	V12141 Tk and pump unit, liq-dispensing trk-mtg.....	0	0	0	0	0	0	0	7	2	0	9
8	V19950 Tk unit, liq-dispensing, tlr-mtg.....	0	0	0	0	0	0	0	0	2	0	2

1-12. Airborne Division

Figure 1-9 shows the organization of the airborne division. Tables 1-20 through 1-24 sum-

marize the weapons and missiles, aircraft, ground support materiel, vehicles, and general equipment in the division.



NOTE: All organic units are airborne units.

Figure 1-9. Airborne division.

Table 1-20. Airborne Division—Weapons and Missiles

1	2	3	4	5	6	7	8	9	10	11	12	13
LIN	Nomenclature	57-4G Div HHC	1-55G Avn bn	5-25G Engr bn	6-200G Div arty	7-35G Inf bn	29-51G DISCOM	11-215G Sig bn	17-75G Armd cav sqdn	19-67G MP co	57-42G Bde HHC	57G Total
2	A90117 Armt subsys, hel, 7.62-mm mg, lt.....	0	25	0	0	0	2	0	6	0	0	33
3	A90426 Armt subsys, hel, 7.62-mm mg/2.75-in RL high rate.....	0	6	0	0	0	0	0	7	0	0	13
4	A90460 Armt subsys, hel, 40-mm GL.....	0	6	0	0	0	0	0	7	0	0	13
5	G02341 Detecting set, mine, tbl, metallic.....	0	0	32	13	3	2	2	0	0	0	76
6	G02478 Detecting set, mine, trk-mtd.....	0	0	1	0	0	0	0	0	0	0	1
7	K57529 How, towed, 105-mm.....	0	0	0	54	0	0	0	0	0	0	54
8	L44575 Lchr, gren, 40-mm.....	0	0	557	60	85	2	15	59	13	9	1498
9	L91975 Mg, cal .50, hv-bbl, flex, for gnd use.....	0	0	0	0	7	8	0	11	0	0	82
10	L92386 Mg, 7.62-mm, lt, flex.....	0	0	17	69	24	29	2	42	8	2	388
11	M68008 Mort, 81-mm, on mount.....	0	0	0	0	9	0	0	6	0	0	87
12	M68282 Mort, 4.2-in, on mount.....	0	0	0	0	4	0	0	0	0	0	36
13	M75577 Mount, tripod, mg, hv, cal .50.....	0	0	0	0	7	8	0	11	0	0	82
14	M75714 Mount, tripod, mg, 7.62-mm.....	0	0	17	69	24	29	2	42	8	2	389
15	N96741 Pistol, cal .45, auto.....	28	0	98	142	248	57	23	115	138	37	2944
16	R91107 Revolver, cal .38, 2-in bbl.....	0	0	0	0	0	0	0	0	2	0	2
17	R91244 Revolver, cal .38, 4-in bbl.....	0	148	0	16	0	11	0	78	0	4	265
18	R94977 Rifle, 5.56-mm with equip.....	114	205	488	1470	573	1590	526	452	0	123	10482
19	R96484 Rifle, rcl, 90-mm.....	0	0	0	0	0	0	0	0	0	2	6
20	R96758 Rifle, rcl, 106-mm, on mount.....	0	0	0	0	12	0	0	12	0	0	120

Table 1-21. Airborne Division—Aircraft

1	2	3	4	5	6	7	8	9	10	11	12	13
LIN	Nomenclature	57-4G Div HHC	1-55G Avn bn	5-25G Engr bn	6-200G Div arty	7-35G Inf bn	29-51G DISCOM	11-215G Sig bn	17-75G Armd cav sqdn	19-67G MP co	57-42G Bde HHC	57G Total
2	K30645 Hel, obsn, OH-6A.....	0	4	0	9	0	0	0	9	0	4	34
3	K31749 Hel, util, UH-1B.....	0	6	0	2	0	0	0	11	0	0	19
4	K31786 Hel, util, UH-1D.....	0	27	0	0	0	2	0	6	0	0	35

Table 1-22. Airborne Division—Ground Support Materiel

1	2	3	4	5	6	7	8	9	10	11	12	13
LIN	Nomenclature	57-4G Div HHC	1-55G Avn bn	5-25G Engr bn	6-200G Div arty	7-35G Inf bn	29-51G DISCOM	11-215G Sig bn	17-75G Armd cav sqdn	19-67G MP co	57-42G Bde HHC	57G Total
2	E68694 Compressor, recip, pwr-driven, air recip, ac, 208-416-v, 60-cy, 3-pl, 15-cfm, 175-psi.....	0	0	0	0	0	3	0	0	0	0	3
3	E69105 Compressor, recip, pwr-driven, air recip, gas- driven, 5-cfm, 175-psi.....	0	0	0	0	0	5	0	0	0	0	5
4	E73626 Compressor, rot, pwr-driven, air, wheelbarrow frame, 2 pneu tires, gas-driven, 60-cfm, 6.5 psi.....	0	0	0	0	2	0	0	0	0	0	18
5	F43077 Crane-shovel, whl-mtd, 7-ton, with boom crane, 24-ft, with block and tackle, 9-ft.....	0	0	0	0	0	3	0	0	0	0	3
6	G69235 Drum, hdlg, atch, forklift trk, chime ring hook.....	0	0	0	0	0	1	0	0	0	0	1
7	J35835 Genr set, diesel-eng, 15-kw, 60-cy, 3-ph, ac, 120/208—240/416-v skid.....	0	0	0	0	0	7	0	0	0	0	7
8	J36109 Genr set, diesel-eng, 30-kw, 60-cy, 3-ph, ac, 120/208—240/416-v, 50-cy, skid.....	0	0	0	0	0	2	0	0	0	0	2
9	J41041 Genr set, gas-eng, tlr-mtd, PU-253/U.....	0	1	0	0	0	0	0	0	0	0	1
10	J41178 Genr set, gas-eng, tlr-mtd, PU-290/MR.....	0	0	0	0	0	13	0	0	0	0	13
11	J41589 Genr set, gas-eng, tlr-mtd, PU-322/G.....	0	0	0	0	0	0	9	0	0	1	12
12	J42685 Genr set, gas-eng, 0.3-kw, ac, 115-v, 1-ph, 400-cy, dc, 24—35-v.....	0	0	0	0	2	0	0	6	0	0	24
13	J42959 Genr set, gas-eng, 0.5-kw, 60-cy, 1-ph, ac, 120-v, shock.....	0	4	0	3	0	1	0	0	0	0	8
14	J43233 Genr set, gas-eng, 0.5-kw, 2-wire, dc, 28-v, shock.....	0	0	0	16	0	0	0	0	1	0	17
15	J43918 Genr set, gas-eng, 1.5-kw, 60-cy, 1-ph, w-wire, ac, 120-v, shock.....	1	1	4	11	0	18	1	2	1	2	45
16	J44055 Genr set, gas-eng, 1.5-kw, dc, 28-v, shock.....	0	0	0	15	2	13	0	6	3	2	61
17	J45699 Genr set, gas-eng, 3-kw, 60-cy, 1—3-ph, 120/240—120/208-v, skid-shock.....	0	2	8	4	1	11	0	2	0	0	36
18	J47068 Genr set, gas-eng, 5-kw, 60-cy, 1—3-ph, ac, 120—240—120/208-v, skid-shock-mtd.....	5	3	0	0	0	20	0	0	0	0	28
19	J74920 Gr, rd, mtg, diesel-driven, 10,000-lb, 12-ft blade with lean front whl.....	0	0	4	0	0	0	0	0	0	0	4
20	L76351 Loader, scoop-type, diesel-driven, 4-whl 1 ½ cu yd.....	0	0	4	0	0	0	0	0	0	0	4
21	P11866 Pneu tool and compressor outfit, 250-cfm tlr-mtd.....	0	0	2	0	0	0	0	0	0	0	2
22	P91756 Pump, cntrf, gas-driven, frame-mtd, 1 ½-in, 65-gpm, 50-ft head.....	0	0	6	0	0	0	0	0	0	0	6
23	P96640 Pumping assy, flammable liq, bulk trf.....	0	11	1	6	0	9	0	2	0	2	35
24	W80378 Trac, FTRAC, low-spd, diesel, lt-dbl, with.....	0	0	6	0	0	0	0	0	0	0	6
25	W89557 Trac, whl, whs, gas, 4,000-lb.....	0	0	0	0	0	4	0	0	0	0	4
26	X48846 Trk, lift, fork, airmble, 4,000-lb cap.....	0	0	0	0	0	7	0	0	0	0	7
27	X48914 Trk, lift, fork, diesel-driven, 6,000-lb cap.....	0	0	0	0	0	1	0	0	0	0	1
28	X49051 Trk, lift, fork, diesel-driven, 10,000-lb cap.....	0	0	0	0	0	3	0	0	0	0	3
29	Y35212 Water purification equip, tlr-mtd, diatomite fil, 600-gph.....	0	0	5	0	0	0	0	0	0	0	5

Table 1-23. Airborne Division — Tactical Vehicles

1	2	3	4	5	6	7	8	9	10	11	12	13
LIN	Nomenclature	57-4G Div HHC	1-55G Avn bn	5-25G Engr bn	6-200G Div arty	7-35G Inf bn	29-51G DISCOM	11-215G Sig bn	17-75G Armd cav sqdn	19-67G MP co	57-42G Bde HHC	57G Total
2	E02807 Chassis, tir, genr, 2 ½-ton, 2 whl, with equip.---	0	0	0	0	0	6	0	0	0	0	6
3	G34805 Dolly set, lift, trans shltr, 2 ½-ton.-----	0	0	0	0	0	41	0	0	0	0	41
4	S72024 Stlr, stake, 12-ton, 4-whl, with equip.-----	0	0	0	0	0	3	0	0	0	0	3
5	S74079 Stlr, van, cgo, 12-ton, 4-whl, with equip.-----	0	0	0	0	0	7	0	0	0	0	7
6	S74490 Stlr, van, expansible, 6-ton, 4-whl, with equip.---	0	0	0	0	0	4	0	0	0	0	4
7	W94030 Trl, ammo, 1 ½-ton, 2-whl, with equip.-----	0	0	0	0	0	0	0	6	0	0	6
8	W94441 Tlr, bsc util, 2 ½-ton, 2 sgl whl with equip.-----	0	0	9	0	0	0	0	0	0	0	9
9	W95400 Tlr, cgo, ¼-ton, 2-whl, with equip.-----	12	7	24	38	29	42	59	37	17	13	536
10	W95537 Tlr, cgo, ¾-ton, 2-whl, with equip.-----	12	26	24	93	14	95	26	30	2	10	464
11	W95811 Tlr, cgo, 1 ½-ton, 2-whl, with equip.-----	0	2	5	16	4	18	2	0	0	0	79
12	W98825 Tlr, tk, water, 400-gal, 1 ½-ton, 2-whl, with equip	1	2	4	13	4	11	2	4	0	1	76
13	X23227 Transporter, airmbl, hyd lift for shltr and X-4 container.-----	0	1	0	0	0	7	0	0	0	0	8
14	X38639 Tr, ambu, ¼-ton, 4X4 with equip.-----	2	1	1	4	6	36	0	6	0	0	104
15	X39735 Tr, cgo, ¾-ton, 4X4, with equip.-----	13	21	0	68	13	95	60	28	2	8	428
16	X39872 Tr, cgo, ¾-ton, 4X4, WWN, with equip.-----	0	8	52	93	1	16	0	8	0	2	192
17	X40009 Tr, cgo, 2 ½-ton, 6X6, with equip.-----	1	3	1	16	6	35	2	2	0	1	117
18	X40146 Tr, cgo, 2 ½-ton, 6X6, WWN, with equip.-----	0	12	6	17	2	2	2	13	0	0	70
19	X40283 Tr, cgo, 2 ½-ton, 6X6, XLWB, with equip.-----	0	0	0	0	0	1	0	0	0	0	1
20	X43434 Tr, dump, 2 ½-ton, 6X6, WWN, with equip.-----	0	0	27	0	0	0	0	0	0	0	27
21	X55627 Tr, platform, util, ½-ton, 4X4, with equip.-----	0	0	28	24	41	3	3	0	0	4	439
22	X57271 Tr, tk, fuel-svc 2 ½-ton, 6X6, with equip.-----	0	0	0	0	0	0	0	2	0	0	2
23	X59326 Tr, trac, 5-ton, 6X6, with equip.-----	0	0	0	0	0	14	0	0	0	0	14
24	X60833 Tr, util, ¼-ton, 4X4, with equip.-----	18	9	28	143	35	56	59	81	30	16	787
25	X61244 Tr, util, ¼-ton, 4X4 carr for 106-mm rifle, with equip.-----	0	0	0	0	0	0	0	12	0	0	12
26	X63025 Tr, wkr, crane, 2 ½-ton, 6X6, WWN, with equip.---	0	0	0	3	0	2	0	1	0	0	6
27	X63162 Tr, wkr, 2 ½-ton, 6X6, WWN, with equip.-----	0	0	1	0	0	0	1	0	0	0	2

Table 1-24. Airborne Division—General Equipment

1	2	3	4	5	6	7	8	9	10	11	12	13
LIN	Nomenclature	57-4G Div HHC	1-55G Avn bn	5-25G Engr bn	6-200G Div arty	7-35G Inf bn	29-51G DISCOM	11-215G Sig bn	17-75G Armd cav sqdn	19-67G MP co	57-42G Bde HHC	57-G Abn div total
2	B84404 Bt, recon, pneu, 3-man.-----	0	0	11	0	0	0	0	0	0	0	11
3	H48568 Fil, meter-module, with flow dividers and hose assys.-----	0	0	0	0	0	3	0	0	0	0	3
4	L85420 Lub-svc unit, pur-op, tlr-mtd, 15 cu ft, air compressor, gas-driven, winterized.-----	0	0	1	0	0	0	0	0	0	0	1
5	V12141 Tk and pump unit, liq-dispensing, tlr-mtg.-----	0	10	2	0	0	1	1	0	0	0	14
6	V19950 Tk unit, liq-dispensing, tlr-mtg.-----	0	0	0	0	0	0	1	0	0	0	1

Section IV. SEPARATE BRIGADES

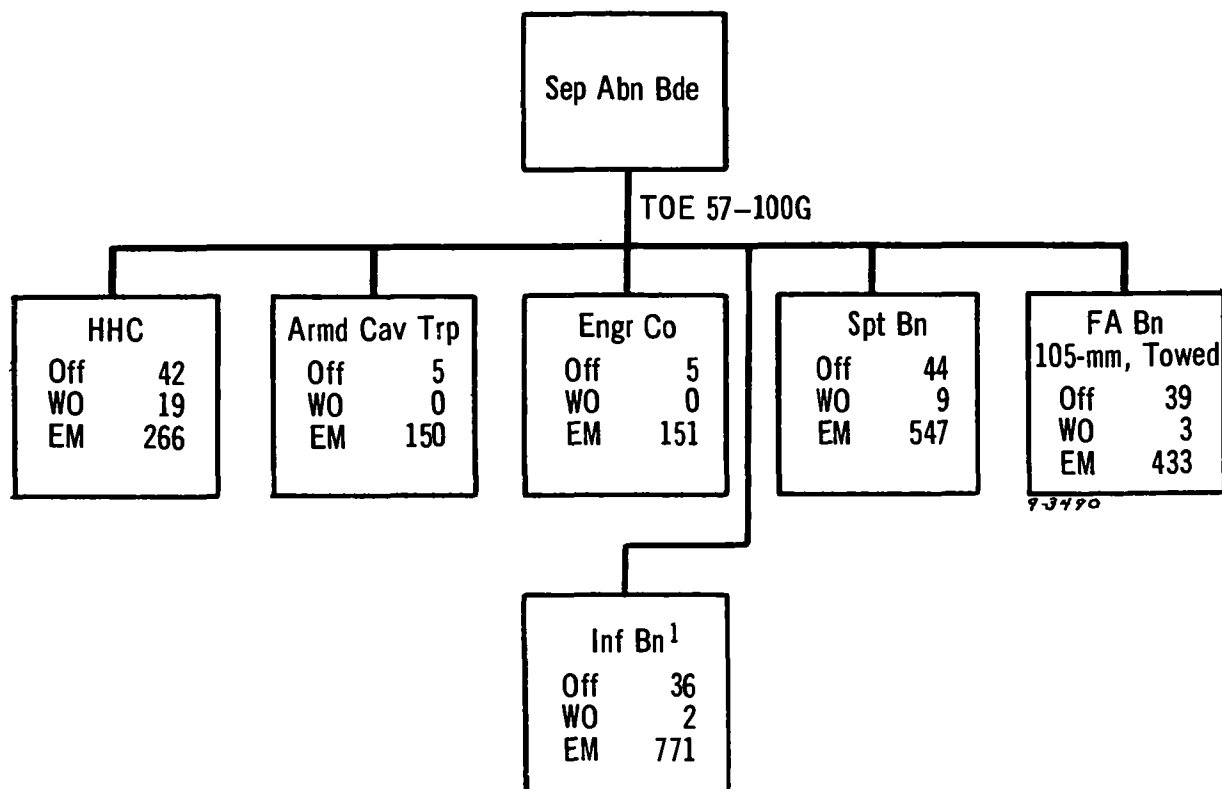
1-13. General

The following paragraphs, figures, and tables provide the planning data for force employment frequently associated with stability operations. The tables and figures show strength of one maneuver battalion. Brigade equipment totals include one maneuver battalion only because total

number of battalions varies with the situation.

1-14. Separate Airborne Brigade

Figure 1-10 shows the organization for the separate airborne brigade (TOE 57-100G), and tables 1-25 and 1-26 summarize its major items of weapons and missiles, and equipment.



¹Number of maneuver bn may vary.

Figure 1-10. Separate airborne brigade.

Table 1-25. Separate Airborne Brigade—Weapons and Missiles

1	2	3	4	5	6	7	8	9
LIN	Nomenclature	57-102G HHC	17-127G Armd cav trp	5-137G Engr co	29-105G Spt bn	6-215G FA bn	7-35G Inf bn	57-100G Total
2	A90117 Armt subsys, hel, 7.62-mm mg, lt.....	8	0	0	0	0	0	8
3	A93124 ARAAV.....	0	6	0	0	0	0	6
4	G02204 Detecting set, mine, AN/PRS-4.....	0	0	4	0	0	0	4
5	G02341 Detecting set, mine, PTBL, metallic.....	0	0	10	1	4	3	18
6	K57529 How, towed, 105-mm.....	0	0	0	0	18	0	18
7	L44575 Lchr, gren, 40-mm.....	16	28	21	2	18	85	170
8	L91975 Mg, cal .50, hy-bbl, flex, for gnd use.....	0	0	0	0	0	7	7
9	L92386 Mg, 7.62-mm, lt, flex.....	5	19	4	11	20	24	83
10	M68008 Mort, 81-mm, on mount.....	0	3	0	0	0	9	12
11	M68282 Mort, 4.2-in, on mount.....	0	0	0	0	0	4	4
12	M75577 Mount, tripod, mg, hv, cal .50.....	0	0	0	0	0	7	7
13	M75714 Mount, tripod, mg, 7.62-mm.....	5	19	4	11	20	24	83
14	N96741 Pistol, cal .45, auto.....	63	52	22	23	40	248	448
15	R50543 Recov veh, ftrac, lt, armd.....	0	1	0	0	0	0	1
16	R91107 Revolver, cal .38, 2-in bbl.....	1	0	0	0	0	0	1
17	R91244 Revolver, cal .38, 4-in bbl.....	31	0	0	2	0	0	33
18	R94977 Rifle, 5.56-mm with equip.....	222	103	134	578	435	561	2033
19	R96758 Rifle, rcl, 106-mm, on mount.....	0	0	0	0	0	12	12
20	U56346 Smg, cal .45.....	0	7	0	0	0	0	7

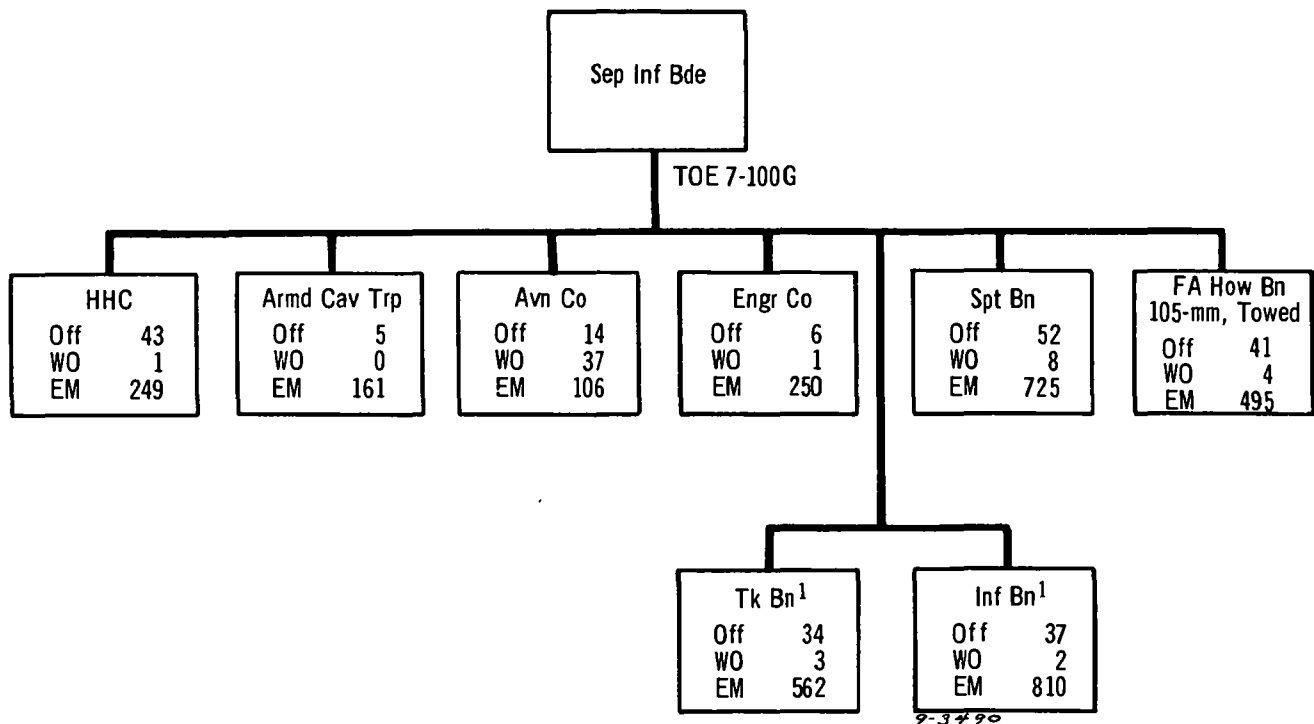
Table 1-26. Separate Airborne Brigade—Mobile Equipment

1	2	3	4	5	6	7	8
LIN	Nomenclature	57-102G HHC	17-127G Armd cav trp	5-137G Engr co	29-105G Spt bn	6-215G FA bn	7-35G Inf bn
2	B84404 Bt, recon, pneu, 3-man-----	0	0	3	0	0	0
3	E68694 Compressor, recip, pwr-driven, air, recip, ac, 208-416-v, 60-cy, 3-ph, 15-cfm, 175-psi-----	0	0	0	1	0	0
4	E69105 Compressor, recip, pwr-driven, air, recip, gas-driven, 5-cfm, 175-psi-----	0	0	0	1	0	0
5	E73626 Compressor, rot, pwr-driven, air, wheelbarrow frame, 2 pneu tires, gas-driven, 60-cfm, 6.5-psi-----	0	0	0	0	0	2
6	F43077 Crane, whl-mtd, 7-ton, with boom crane, 24-ft with block and tackle, 9-ft-----	0	0	0	1	0	0
7	G34805 Dolly set, lift, trans, shelter, 2 ½-ton-----	0	0	0	27	0	0
8	G69235 Drum, hdlg, atch, forklift trk, chime ring hook-----	0	0	0	1	0	0
9	J35835 Genr set, diesel eng, 15-kw, 60-cy, 3-ph, ac, 120/208- 240/416-v, skid-----	0	0	0	1	0	0
10	J41178 Genr set, gas-eng, tlr-mtd, PU-290/MR-----	0	0	0	4	0	0
11	J41589 Genr set, gas-eng, tlr-mtd, PU-322/G-----	0	0	0	1	0	0
12	J42685 Genr set, gas-eng, 0.3-kw, ac, 115-v, 1-ph, 400-cy, dc, 24-35-v-----	0	2	0	0	0	2
13	J42959 Genr set, gas-eng, 0.5-kw, 60-cy, 1-ph, ac, 120-v, shock-----	0	0	0	2	1	0
14	J43233 Genr set, gas-eng, 0.5-kw, 2-wire, dc, 28-v, shock-----	0	0	0	0	5	0
15	J43918 Genr set, gas-eng, 1.5-kw, 60 cy, 1-ph, 2-wire, ac, 120-v shock-----	2	0	1	11	3	0
16	J44055 Genr set, gas-eng, 1.5-kw, dc, 28-v, shock-----	2	0	1	4	4	2
17	J45699 Genr set, gas-eng, 3-kw, 60-cy 1-3-ph, 120/240-v, 120/208-v, skid-shock-mtd-----	0	0	2	4	1	1
18	J47063 Genr set, gas-eng, 5-kw, 60-cy 1-3-ph, ac, 120-240- 120/208-v, skid-shock-mtd-----	0	0	0	10	0	0
19	J74920 Grader, rd, mtg, diesel-driven 1,000-lb, 12-ft blade, with lean front whl-----	0	0	2	0	0	0
20	J75239 Grader, scraper atch, for grader rd-----	0	0	1	0	0	0
21	K30645 Hel, obsn, OH-6A-----	6	0	0	0	0	0
22	K31786 Hel, util, UH-1D-----	8	0	0	0	0	0
23	L76351 Loader, scoop-type, diesel-driven, 4-whl, 1 ½-cu yd-----	0	0	1	0	0	0
24	P91756 Pump, cntrf, gas-driven, frame-mtd, 1 ½-in, 65-gpm, 50-ft head-----	0	0	2	0	0	0
25	P96640 Pumping assy, flammable liq, bulk trf-----	6	0	0	2	1	0
26	S10682 Roller, airmbl, vibrating-----	0	0	1	0	0	0
27	S72024 Stlr, stake, 12-ton, 4-whl, with equip-----	0	0	0	1	0	0
28	V12141 Tk and pump unit, liq-dispensing, trk-mtg-----	1	0	0	0	0	0
29	V19950 Tk unit, liq-dispensing, tlr-mtg-----	0	0	0	2	0	0
30	W30378 Trac, FTRAC, low-spd, diesel, lt dbp, with bulldozer scarrfier teeth, PCU-----	0	0	2	0	0	0
31	W89557 Trac, whl whs, gas, 4,000-lb-----	0	0	0	1	0	0
32	W94441 Tlr, basic, util, 2 ½-ton, 2 sgl whl, with equip-----	0	0	3	0	0	0
33	W95400 Tlr, cgo, ¼-ton, 2-whl, with equip-----	36	12	6	24	9	29
34	W95537 Tlr, cgo, ¾-ton, 2-whl, with equip-----	16	4	2	45	24	14
35	W95811 Tlr, cgo, 1 ½-ton, 2-whl, with equip-----	0	0	0	13	5	4
36	W98825 Tlr, tk, water, 400-gal, 1 ½-ton, 2-whl, with equip-----	1	1	1	4	4	4
37	X38639 Trk, amb, ¼-ton, 4x4, with equip-----	2	0	0	9	1	6
38	X39735 Trk, cgo, ¾-ton, 4x4, with equip-----	11	3	0	46	17	13
39	X39872 Trk, cgo, ¾-ton, 4x4, WWN, with equip-----	5	1	12	4	29	1
40	X40009 Trk, cgo, 2 ½-ton, 6x6, with equip-----	1	1	0	13	5	6
41	X40146 Trk, cgo, 2 ½-ton, 6x6, WWN, with equip-----	2	2	1	4	5	2
42	X43434 Trk, dump, 2 ½-ton, 6x6, WWN, with equip-----	0	0	7	0	0	0
43	X48846 Trk, lift, fork, airmbl, 4,000-lb cap-----	0	0	0	2	0	0
44	X48914 Trk, lift, fork, diesel-driven, 6,000-lb cap-----	0	0	0	1	0	0
45	X49051 Trk, lift, fork, diesel-driven, 10,000-lb cap-----	0	0	0	1	0	0
46	X55627 Trk, platform, util, ½-ton, 4x4, with equip-----	3	0	9	1	8	41
47	X59326 Trk, trac, 5-ton, 6x6, with equip-----	0	0	0	1	0	0
48	X60833 Trk, util, ¼-ton, 4x4, with equip-----	44	29	6	27	40	35
49	X63025 Trk, wkr, crane, 2 ½-ton, 6x6, WWN, with equip-----	0	0	0	0	1	0
50	X63094 Trk, wkr, ¾-ton, 4x4, with equip-----	0	0	0	2	0	0
51	Y36239 Water purification set, ptbl, 600-gph-----	0	0	1	0	0	0

1-15. Separate Infantry, Infantry (Mechanized), and Armored Brigades

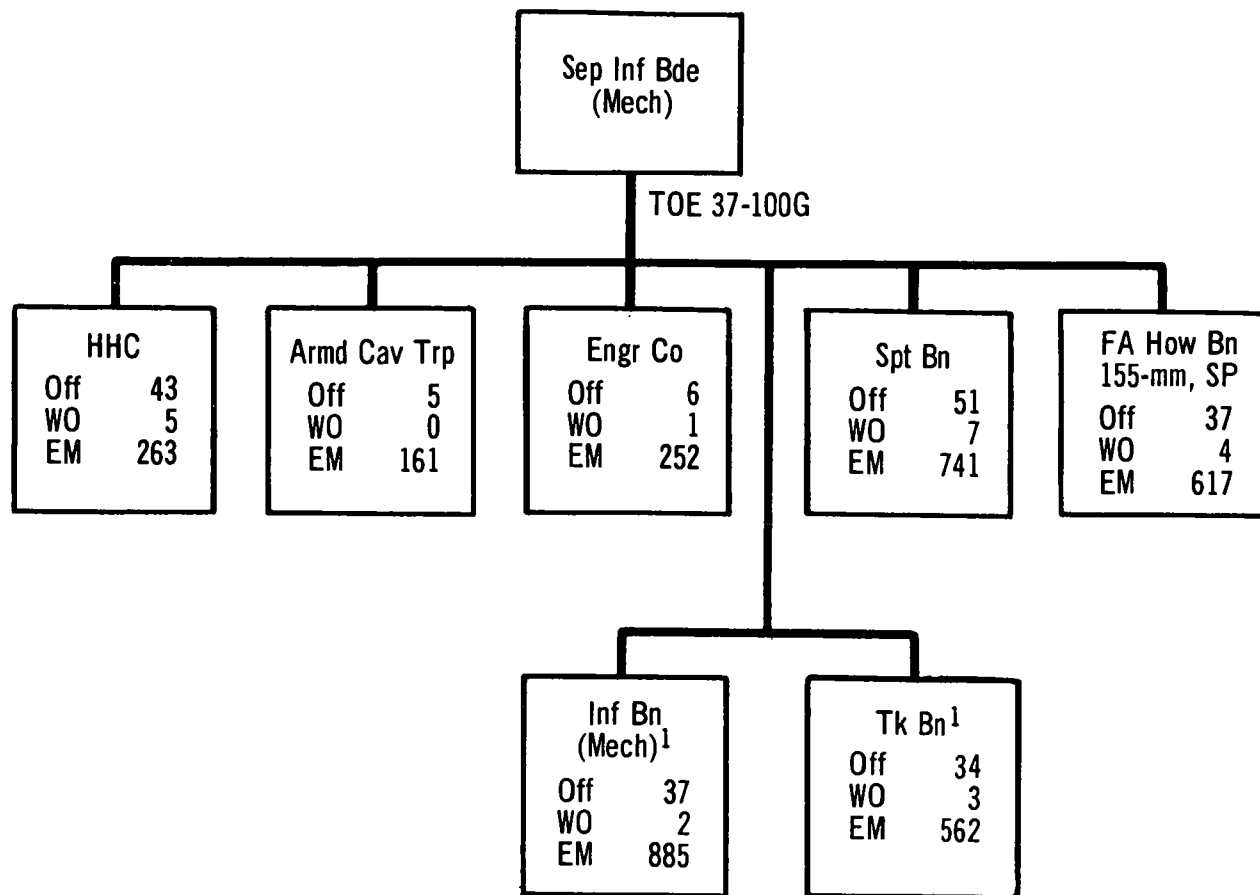
Figures 1-11 through 1-13 show the organization for the separate infantry brigade (TOE 7-100G), the infantry brigade (mechanized) (TOE 37-

100G), and the armored brigade (TOE 17-100G) respectively; and tables 1-27 and 1-28 summarize their major items of weapons and missiles, and equipment.



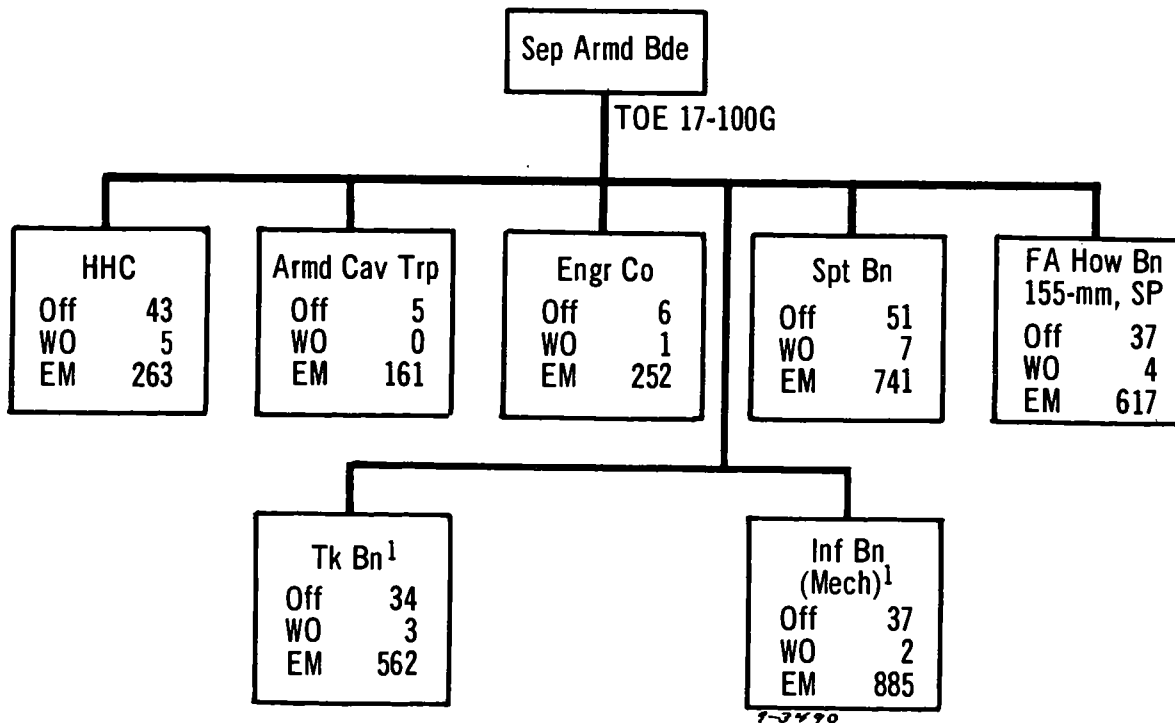
¹Number and type of maneuver bn may vary.

Figure 1-11. Separate infantry brigade.



¹Number and type of maneuver bn may vary.

Figure 1-12 Separate infantry brigade (mechanized).



¹Number and type of maneuver bn may vary.

Figure 1-13. Separate armored brigade.

Table 1-27. Separate Infantry, Infantry (Mechanized), and Armored Brigades—Weapons and Missiles

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
LIN	Nomenclature	7-15G Inf bn	7-45G Inf bn (mech)	7-102G HHC, sep inf bde	17-102G HHC, sep armd bde	37-102G HHC, sep inf bde (mech)	17-107G Armd cav trp	17-35G Tk bn	1-47G Avn co	5-107G Engr co	5-127G Engr co, sep bde	6-185G FA bn, sep inf bde	6-375G FA bn, sep inf bde	29-75G Spt bn, sep armd/inf bde (mech)	29-135G Spt bn, sep inf bde
2	A90117 Armt, subsys, hel, 7.62-mm mg, lt.....	0	0	0	0	0	0	0	10	0	0	0	0	0	0
3	A90154 Armt subsys, hel, 7.62-mm mg, high-rate....	0	0	0	0	0	0	0	9	0	0	0	0	0	0
4	A90426 Armt subsys, hel, 7.62-mm mg/2.75-in RL, high-rate.....	0	0	0	0	0	0	0	4	0	0	0	0	0	0
5	A90460 Armt subsys, hel, 40-mm GL.....	0	0	0	0	0	0	0	4	0	0	0	0	0	0
6	E56577 CEV, FTRAC.....	0	0	0	0	0	0	0	0	2	2	0	0	0	0
7	G02341 Detecting set, mine, ptbl, metallic.....	4	2	0	0	0	3	4	0	10	10	4	5	1	2
8	J93997 Guidance and launching sta, with equip (Entac).....	3	3	0	0	0	0	0	0	0	0	0	0	0	0
9	K57529 How, towed, 105-mm.....	0	0	0	0	0	0	0	0	0	0	18	0	0	0
10	K57666 How, mdm, SP, 155-mm.....	0	0	0	0	0	0	0	0	0	0	0	18	0	0
11	L44575 Lchr, gren, 40-mm.....	85	94	15	15	15	31	19	0	23	25	21	54	8	8
12	L45123 Lchr, rkt, multiple, 115-mm.....	0	0	0	0	0	0	0	0	0	0	3	3	0	0
13	L91975 Mg, cal .50, hv-bbl, flex, for gnd use.....	13	24	4	4	4	1	22	0	0	0	0	0	0	0
14	L92386 Mg, 7.62-mm, lt, flex.....	25	49	5	7	7	3	4	2	5	5	33	40	24	24
15	M68008 Mort, 81-mm, on mount.....	9	9	0	0	0	0	0	0	0	0	0	0	0	0
16	M68282 Mort, 4.2-in, on mount.....	4	4	0	0	0	3	4	0	0	0	0	0	0	0
17	M75577 Mount, tripod, mg, hv, cal .50.....	13	24	4	4	4	1	22	0	0	0	0	0	0	0
18	M75714 Mount, tripod, mg, 7.62-mm.....	25	49	5	7	7	3	4	2	5	5	33	40	24	24
19	N96741 Pistol, cal .45, auto.....	239	256	68	61	62	76	323	0	38	39	47	77	30	30
20	R50543 Recov veh, FTRAC, lt, armd.....	0	5	0	0	0	1	0	0	0	0	0	1	0	0
21	R50680 Recov veh, FTRAC, mdm.....	0	0	0	0	0	0	5	0	0	0	0	0	1	1
22	R91107 Revolver, cal .38, 2-in bbl.....	0	0	1	1	1	0	0	0	0	0	0	0	0	0
23	R91244 Revolver, cal .38, 4-in bbl.....	0	0	0	5	5	0	0	66	0	0	0	0	0	5
24	R95114 Rifle, 7.62-mm.....	554	606	207	228	227	84	276	91	196	198	493	583	754	738
25	R95251 Rifle, 7.62-mm, auto, with bipod.....	56	54	6	6	6	6	0	0	23	23	0	0	19	19
26	R96484 Rifle, rcl, 90-mm.....	18	18	3	3	3	0	0	0	0	0	0	0	0	0
27	R96758 Rifle, rcl, 106-mm, on mount.....	8	6	0	0	0	0	0	0	0	0	0	0	0	0
28	U56346 Smg, cal .45.....	0	10	0	0	0	12	118	0	0	0	0	0	0	0
29	V12826 Tk, cbt, FTRAC, 76-mm gun.....	0	0	0	0	0	9	0	0	0	0	0	0	0	0
30	V13100 Tk, cbt, FTRAC, 105-mm gun.....	0	0	0	0	0	0	54	0	0	0	0	0	0	0

Table 1-28. Separate Infantry, Mechanized, and Armored Brigades—Mobile Equipment

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
LIN	Nomenclature	7-15G Inf bn	7-45G Inf bn (mech)	7-102G HHC, sep inf bde	17-102G HHC, sep armd bde	37-102G HHC, sep inf bde (mech)	17-107G Armd cav trp	17-35G Tk bn	1-47G Avn co	5-107G Engr co	5-127G Engr co, sep bde	6-185G FA bn, sep inf bde	6-375G FA bn, sep inf bde	15 29-75G Spt bn, sep armd/inf bde (mech)	29-135G Spt bn, sep inf bde
2	B83582 Bt, brg, erection, inboard, eng, aluminum, gas-driven, 27-ft lg.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	B83856 Bt, ldg, inflatable, aslt crft, nylon cloth, 15-man.....	0	0	0	0	0	0	0	0	9	9	0	0	0	0
4	B84404 Bt, recon, pneu, 3-man.....	0	0	0	0	0	0	0	0	6	6	0	0	0	0
5	C20414 Brg, armor veh launched, scissor-type, cl-60, aluminum, 60-ft lgth of span.....	0	0	0	0	0	0	2	0	3	3	0	0	0	0
6	C22469 Brg ferry unit, end bay, amph mob float aslt.....	0	0	0	0	0	0	0	0	4	4	0	0	0	0
7	C22606 Brg ferry unit, interior bay amph, mob float aslt.....	0	0	0	0	0	0	0	0	8	8	0	0	0	0
8	C25072 Brg, fltg, hwy, aluminum deck, balk superstruc (army).....	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	C25346 Brg, fltg, hwy, cl-60, 135-ft (army).....	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	C25620 Brg, fltg, mob aslt amph, 36-ft 1-in lg, 10-ft wide, 4-in high.....	0	0	0	0	0	0	0	0	8	8	0	0	0	0
11	C25757 Brg, fltg raft sec, lt, tac.....	0	0	0	0	0	0	0	0	1	1	0	0	0	0
12	C26305 Brg erection set, fltbrg, cl-60, stl-aluminum deck, balk superstruc.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	C29490 Bucket, clamshell, ¾ cu yd.....	0	0	0	0	0	0	0	0	1	1	0	0	0	0
14	C30997 Bucket, dragline, ¾ cu yd.....	0	0	0	0	0	0	0	0	1	1	0	0	0	0
15	D11401 Carr, comd and recon, armd.....	0	14	0	3	3	16	9	0	0	0	0	0	0	0
16	D11538 Carr, CP, lt-tracked.....	0	7	0	5	5	0	7	0	0	0	0	10	0	0
17	D12086 Carr pers, FTRAC, armd.....	0	49	0	4	4	7	13	0	0	10	0	0	0	0
18	E02670 Chassis, tlr, GP, 3 ½-ton, 2-whl, with equip.....	0	0	0	0	0	0	0	0	0	0	0	0	1	1
19	E69242 Compressor, recip, pwr-driven, air, recip, gas-driven, 15-cfm, 175-psi.....	0	1	0	0	0	0	1	0	0	0	0	0	0	0
20	E70064 Compressor, recip, pwr-driven, trk, 2-whl pneu tires, gas-driven, 5-cfm, 175-psi.....	0	0	0	0	0	1	0	0	0	0	0	0	0	0
21	E73626 Compressor, rot, pwr-driven, air, wheelbarrow frame, 2-pneu tires, gas-driven, 60-cfm, 6.5 psi.....	0	0	0	0	0	0	0	0	1	1	0	0	0	0
22	F39241 Crane, whl-mtd, 5-ton, ¾ cu yd, diesel, 4x4, rough terrain, airtrans.....	0	0	0	0	0	0	0	0	0	0	0	0	1	1
23	F39378 Crane, whl-mtd, 20-ton, ¾ cu yd, rough terrain.....	0	0	0	0	0	0	0	0	1	1	0	0	0	0
24	G69235 Drum, hdlg atch, forklift trk, chime ring hook.....	0	0	0	0	0	0	0	0	0	0	0	0	1	1
25	H32869 Fairlead roller and sheave, 12 ½-ton crane- shovel crawler, 20-ton crane-shovel trk....	0	0	0	0	0	0	0	0	0	1	0	0	0	0
26	H38787 Ferry conversion set, raft, inf spt.....	0	0	0	0	0	0	0	0	1	1	0	0	0	0
27	J04716 Fuel sys SUPPT, ptbl, 6,000-gal cap.....	0	0	0	0	0	0	0	0	0	0	0	0	1	1
28	J41178 Genr set, gas-eng, tlr-mtd, PU-290/MR.....	0	0	0	0	0	0	0	0	0	0	0	0	2	3

Table 1-28—Continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
LIN	Nomenclature	7-15G Inf bn	7-45G Inf bn (mech)	7-102G HHC, sep inf bde	17-102G HHC, sep armd bde	37-102G HHC, sep inf bde (mech)	17-107G Armd cav trp	17-35G Tk bn	1-47G Avn co	5-107G Engr co	5-127G Engr co, sep bde	6-185G FA bn, sep inf bde	6-375G FA bn, sep inf bde	29-75G Spt bn, sep armd/inf bde (mech)	29-135G Spt bn, sep inf bde
29	J42685 Genr set, gas-eng, 0.3-kw, ac, 115-v, 1-ph, 400-cy, dc, 24—35-v	4	4	0	0	0	2	4	0	0	0	0	0	0	0
30	J42822 Genr set, gas-eng, 0.4-kw, ac, 1-ph, 400-cy, 115-v, 0.08 kw, dc, 28 v, shock, PU-422U	2	2	0	0	0	0	2	0	0	0	0	0	0	0
31	J42959 Genr set, gas-eng, 0.5-kw, 60-cy, 1-ph, ac, 120-v, shock	0	0	0	0	0	0	0	0	0	0	1	1	0	1
32	J43096 Genr set, gas eng, 0.5-kw, 400-cy, 1- and 3-phase, ac, 120—120/240—120/208-v	0	0	0	0	0	0	0	0	0	0	0	6	0	0
33	J43233 Genr set, gas-eng, 0.5-kw, 2-wire, dc, 28-v, shock	0	0	0	0	0	0	0	0	0	0	20	9	9	9
34	J43918 Genr set, gas-eng, 1.5-kw, 60-cy, 1-ph, 2-wire, ac, 120-v shock	3	3	1	1	1	0	1	3	1	1	4	1	15	16
35	J44055 Genr set, gas-eng, 1.5-kw, dc, 28-v, shock	3	1	1	0	1	0	4	0	1	1	0	1	0	0
36	J45699 Genr set, gas-eng, 3-kw, 60-cy, 1—3-ph, 120/240-v—120/208-v skid-shock	1	1	2	2	2	0	0	0	3	3	1	0	5	5
37	J47068 Genr set, gas-eng, 5-kw, 60-cy, 1—3-ph, ac, 120—240—120/208-v, skid-shock, mtd	1	1	3	0	0	0	1	1	0	0	0	0	6	0
38	J74852 Grader, rd, mtg, diesel-driven, hv, 6x4, front-whl steering	0	0	0	0	0	0	0	0	1	1	0	0	0	0
39	K30645 Hel, obsn, OH-6A	0	0	0	4	4	0	0	18	0	0	0	0	0	0
40	K31749 Hel, util, UH-1B	0	0	0	0	0	0	0	4	0	0	0	0	0	0
41	K31786 Hel, util, UH-10	0	0	0	0	0	0	0	10	0	0	0	0	0	0
42	K90188 Inst rep shop, trk-mtd, 2 1/2-ton, 6x6, with equip	0	0	0	0	0	0	0	0	0	0	0	0	2	2
43	L01326 Ion exch unit, water purification, trk-mtd, 3,000-gph, max flow	0	0	0	0	0	0	0	0	1	1	0	0	0	0
44	L43664 Launch, M60-series, tk chassis, trans, 40- and 60-ft brg, type, cl-60	0	0	0	0	0	0	2	0	2	2	0	0	0	0
45	L85420 Lub-svc unit, pwr-op, tlr-mtd, 15-cf, air compressor, gas-driven, winterized	0	0	0	0	0	0	0	0	0	0	0	0	1	1
46	P96640 Pumping assy, flammable liq, bulk-trf	0	0	0	1	1	0	0	2	2	2	0	0	2	2
47	R11462 Ramp load veh, mob aslt amph fltbrg, 39-ft 4-in x 10-ft x 11-ft	0	0	0	0	0	0	0	0	4	4	0	0	0	0
48	S70243 Stlr, low-bed, wkr, 12-ton, 4-whl, 40-ft, with equip	0	0	0	0	0	0	0	0	0	0	0	0	0	1
49	S70517 Stlr, low-bed, 25-ton, 4-whl, with equip	0	0	0	0	0	0	0	0	3	3	0	0	0	0
50	S72024 Stlr, stake, 12-ton, 4-whl, with equip	0	0	0	0	0	0	0	0	0	0	0	0	14	15
51	S72983 Stlr, tk, fuel-svc, 5,000-gal, 12-ton, 4 whl, with equip	0	0	0	0	0	0	0	0	0	0	0	0	9	9
52	S73394 Stlr, tk, transporter, 50-ton, 8-whl, with equip	0	0	0	0	0	0	0	0	0	0	0	0	2	1
53	S74079 Stlr, van, cgo, 12-ton, 4-whl, with equip	0	0	0	0	0	0	0	0	0	0	0	0	0	2
54	T10138 Shop equip, contact maint, trk-mtd	0	0	0	0	0	0	0	0	1	1	0	0	5	5
55	T10275 Shop equip, elect up, stlr-mtd (army)	0	0	0	0	0	0	0	0	0	0	0	0	1	1

Table 1-28—Continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
LIN	Nomenclature	7-15G Inf bn	7-45G Inf bn (mech)	7-102G HHC, sep inf bde	17-102G HHC, sep armd bde	37-102G HHC, sep inf bde (mech)	17-107G Armd cav trp	17-35G Tk bn	1-47G Avn co	5-107G Engr co	5-127G Engr co, sep bde	6-185G FA bn, sep inf bde	6-375G FA bn, sep inf bde	29-75G Spt bn, sep armd/inf bde (mech)	29-135G Spt bn, sep inf bde
56	V09730 Tagline crane and crane-shovel, $\frac{3}{4}$ —1 cu yd bucket.....	0	0	0	0	0	0	0	0	1	1	0	0	0	0
57	V12141 Tk and pump unit, liq-dispensing, trk-mtg.....	2	4	1	1	1	0	5	0	1	1	1	2	2	2
58	V19950 Tk unit, liq-dispensing, tlr-mtg.....	2	4	0	0	0	0	5	5	1	1	0	2	0	0
59	W76816 Trac, FTRAC, low-spd, diesel, mdm dbp, with bulldozer with scarifier winch.....	0	0	0	0	0	0	0	0	2	2	0	0	0	0
60	W94030 Tlr, ammo, 1 $\frac{1}{2}$ -ton, 2-whl, with equip.....	0	4	0	0	0	0	0	0	0	9	17	29	0	0
61	W94441 Tlr, basic, util, 2 $\frac{1}{2}$ -ton, 2-sgl whl, with equip.....	0	0	0	0	0	0	0	0	10	1	0	0	0	0
62	W95400 Tlr, cgo, $\frac{1}{4}$ -ton, 2-whl, with equip.....	39	31	46	46	47	1	15	4	10	10	25	21	34	35
63	W95537 Tlr, cgo, $\frac{3}{4}$ -ton, 2-whl, with equip.....	36	12	13	13	13	1	4	4	4	3	24	22	27	28
64	W95811 Tlr, cgo, 1 $\frac{1}{2}$ -ton, 2-whl, with equip.....	16	14	9	7	7	1	21	12	4	4	14	14	58	60
65	W96907 Tlr, flat-bed, 10-ton, 4-whl, with equip.....	0	0	0	0	0	0	0	0	1	1	0	0	0	0
66	W98825 Tlr, tk, water, 4,000-gal, 1 $\frac{1}{2}$ -ton, 2-whl, with equip.....	4	4	1	1	1	0	4	1	1	1	5	6	5	5
67	X38639 Trk, amb, $\frac{1}{4}$ -ton, 4x4, with equip.....	6	3	3	2	2	0	3	0	0	0	0	0	0	0
68	X38776 Trk, amb, $\frac{3}{4}$ -ton, 4x4, with equip.....	0	0	2	2	2	0	0	0	0	0	1	1	18	18
69	X39735 Trk, cgo, $\frac{3}{4}$ -ton, 4x4, with equip.....	38	10	18	15	15	0	2	4	3	2	22	25	29	29
70	X39872 Trk, cgo, $\frac{3}{4}$ -ton, 4x4, WWN, with equip.....	2	5	0	1	1	1	6	1	0	0	12	12	1	2
71	X40009 Trk, cgo, 2 $\frac{1}{2}$ -ton, 6x6, with equip.....	9	5	3	3	3	0	6	2	0	0	14	15	56	57
72	X40146 Trk, cgo, 2 $\frac{1}{2}$ -ton, 6x6, WWN, with equip....	9	4	3	3	3	1	14	6	7	8	45	11	9	10
73	X40420 Trk, cgo, 2 $\frac{1}{2}$ -ton, 6x6, XLWB, WWN, with equip.....	0	0	0	0	0	0	0	0	0	0	0	0	0	1
74	X40831 Trk, cgo, 5-ton, 6x6, LWB, with equip.....	0	6	0	0	0	0	13	0	0	0	0	16	0	0
75	X40968 Trk, cgo, 5-ton, 6x6, LWB, WWN, with equip.....	2	8	0	0	0	0	7	0	0	0	1	15	0	0
76	X43845 Trk, dump, 5-ton, 6x6, WWN, with equip....	0	0	0	0	0	0	0	0	13	4	0	0	0	0
77	X48914 Trk, lift, fork, diesel-driven, 6,000-lb.....	0	0	0	0	0	0	0	0	0	0	0	0	2	2
78	X56586 Trk, stake, 5-ton, 6x6, WWN, with equip....	0	0	0	0	0	0	0	0	1	1	0	0	0	0
79	X57271 Trk, tk, fuel-svc, 2 $\frac{1}{2}$ -ton, 6x6, with equip....	0	0	0	1	1	0	1	5	0	0	0	0	2	2
80	X59189 Trk, trac, 2 $\frac{1}{2}$ -ton, 6x6, WWN, with equip....	0	0	0	0	0	0	0	0	0	0	0	0	1	1
81	X59326 Trk, trac, 5-ton, 6x6, with equip.....	0	0	0	0	0	0	0	0	0	0	0	0	27	31
82	X59600 Trk, trac, 10-ton, 6x6, with dual-midship winch, with high-mtd 5th whl, with equip....	0	0	0	0	0	0	0	0	0	0	0	0	2	1
83	X59874 Trk, trac, 10-ton, 6x6, with midship winch, with low-mtd 5th whl, with equip.....	0	0	0	0	0	0	0	0	3	3	0	0	0	0
84	X60696 Trk, trac, wkr, 5-ton, 6x6, WWN, with equip.....	0	0	0	0	0	0	0	0	0	0	0	0	0	1
85	X60833 Trk, util, $\frac{1}{4}$ -ton, 4x4, with equip.....	45	31	47	47	48	3	34	4	10	10	37	33	35	36
86	X61244 Trk, util, $\frac{1}{4}$ -ton, 4x4, carr for 106-mm rifle, with equip.....	8	6	0	0	0	0	0	0	0	0	0	0	0	0
87	X62340 Trk, van, shop, 2 $\frac{1}{2}$ -ton, 6x6, with equip....	1	2	6	2	2	0	0	2	0	0	3	2	10	13
88	X63299 Trk, wkr, 5-ton, 6x6, WWN, with equip....	1	1	1	1	1	0	2	0	1	1	1	1	3	3
89	X35486 Water purification equip set, trk-mtd, diatomite fil, 1,500-gph (army).....	0	0	0	0	0	0	0	0	2	2	0	0	0	0

1-16. Separate Light Infantry Brigade

Figure 1-14 shows the separate light infantry

brigade organization. Tables 1-29 and 1-30 show the major items of equipment.

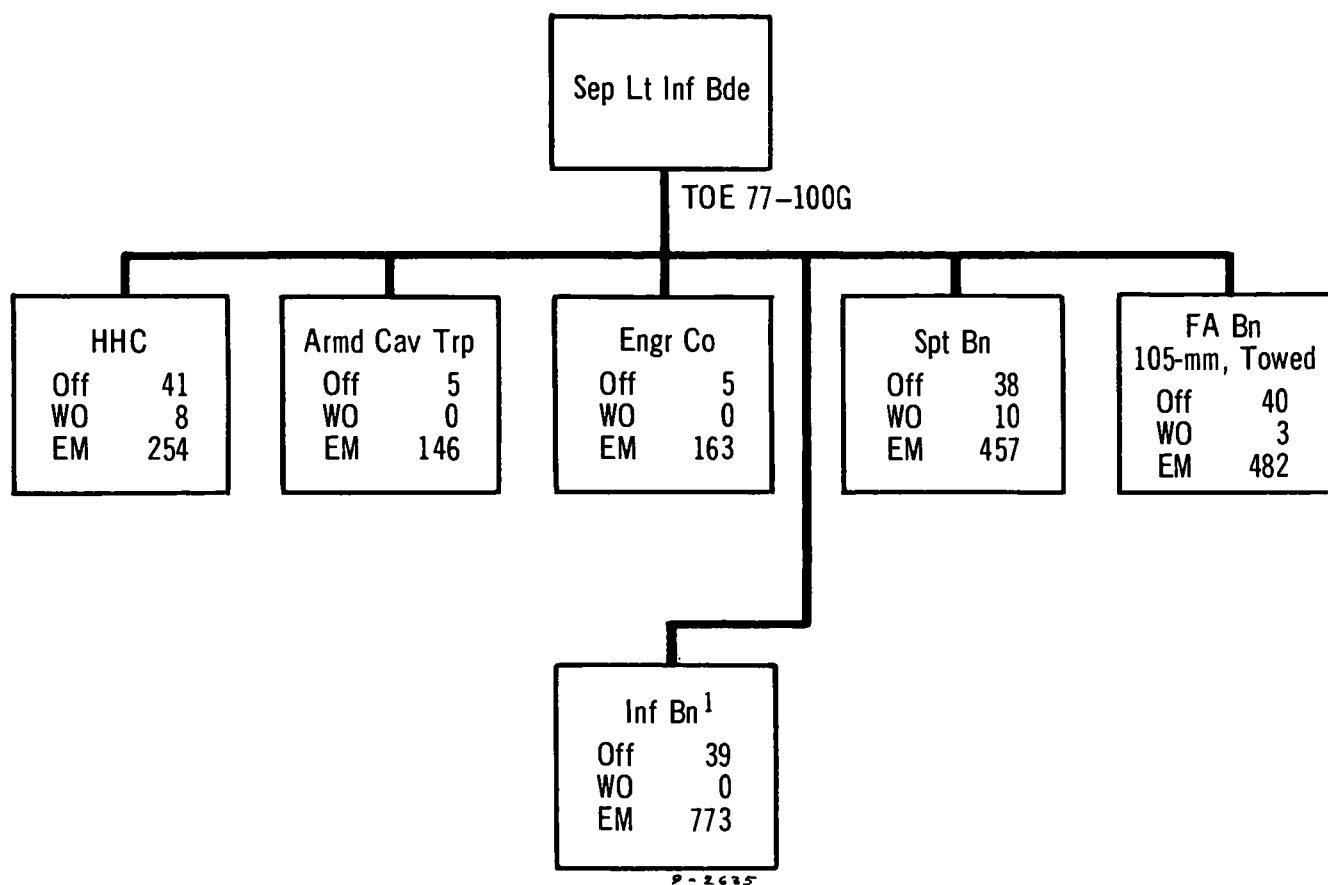
¹Number of maneuver bn may vary.

Figure 1-14. Separate light infantry brigade.

Table 1-29. Separate Light Infantry Brigade—Weapons and Missiles

1	2	3	4	5	6	7	8	9
LIN	Nomenclature	77-102G HHC	17-117G Armd cav trp	5-207G Engr co	29-245G Spt bn	6-115G FA bn	7-175G Inf bn	77-100G Sep lt inf bde total
2	A90154 Armt subsys, hel, 7.62-mm mg, high rate.....	8	0	0	0	0	0	8
3	A93124 Armd-recon abn aslt veh.....	0	6	0	0	0	0	6
4	G02204 Detecting set, mine, ptbl, metallic.....	0	0	4	0	4	2	10
5	G02341 Detecting set, mine, ptbl, metallic.....	0	0	10	1	4	7	22
6	K57392 How, lt, towed, 105-mm.....	0	0	0	0	18	0	18
7	K57529 How, towed, 105-mm.....	0	0	0	0	18	0	18
8	L44575 Lchr, gren, 40-mm.....	15	28	21	0	18	86	168
9	L92386 Mg, 7.62-mm, lt, flex.....	5	19	7	7	27	20	85
10	N68008 Mort, 81-mm, on mount.....	0	3	0	0	0	13	16
11	N75714 Mount, tripod, mg, 7.62-mm.....	5	19	7	7	27	20	85
12	N96741 Pistol, cal .45 auto.....	73	52	23	17	42	233	440
13	R50543 Recov veh, FTRAC, lt, armd.....	0	1	0	1	0	0	2
14	R91107 Revolver cal .38, 2-in bbl.....	1	0	0	0	0	0	1
15	R91244 Revolver, cal .38, 4-in bbl.....	9	0	0	1	0	0	10
16	R94977 Rifle, 5.56-mm, with bipod.....	214	99	145	488	273	345	1564
17	R96484 Rifle, rcl, 90-mm.....	0	0	0	0	0	18	18
18	R96758 Rifle, rcl, 106-mm, on mount.....	0	0	0	0	0	8	8
19	U56346 Smg, cal .45.....	0	7	0	0	0	0	7

Table 1-30. Separate Light Infantry Brigade—Mobile Equipment

1	2	3	4	5	6	7	8	9
LIN	Nomenclature	77-102G HHC	17-117G Armd cav trp	5-207G Engr co	29-245G Spt bn	6-115G FA bn	7-175G Inf bn	77-100G Sep lt inf bde total
2	B84404 Bt, recon, pneu, 3-man.....	0	0	3	0	0	0	3
3	F02944 Chassis, 2 1/2-ton trailing arm, 2-whl.....	0	0	0	1	0	0	1
4	F67735 Compressor, recip, pwr-driven base, ac, 115-v, 60-cy, 1-ph, 2.7-cfm, 80-psi.....	0	0	0	1	0	0	1
5	F69105 Compressor, recip, pwr-driven, air rcvr, gas-driven, 5-cfm, 175-psi.....	0	0	0	3	0	0	3
6	E69242 Compressor, recip, pwr-driven, air rcvr, gas-driven, 15-cfm, 175-psi.....	0	0	0	1	1	0	2
7	E70064 Compressor, recip, pwr-driven, trk, 2-whl pneu tires, gas-driven, 5-cfm, 175-psi.....	1	1	0	2	4	1	9
8	G34805 Dolly set lift, trans-shelter, 2 1/2-ton.....	0	0	0	8	0	0	8
9	G34815 Dolly set, lift, trans-shelter, 5 1/4-ton, with equip..	0	0	0	31	0	0	31
10	G69235 Drum, hdlg atch, forklift-trk, chime ring hook....	0	0	0	1	0	0	1
11	J41452 Genr set, gas-eng, tlr-mtd, PU-304 MPQ 4A.....	0	0	0	0	1	0	1
12	J41589 Genr set, gas-eng, tlr-mtd, PU-322/G.....	0	0	0	1	0	0	1
13	J42000 Genr set, gas-eng, tlr-mtd, PU-474/U.....	0	0	0	5	0	0	5
14	J42959 Genr set, gas-eng, 0.5-kw, 60-cy, 1-ph, ac, 120-v, shock.....	0	0	0	1	1	0	2
15	J43233 Genr set, gas-eng, 0.5-kw, 2-wire, dc, 28-v, shock..	0	0	0	1	9	0	10
16	J43918 Genr set, gas-eng, 1.5-kw, 60-cy, 1-ph, 2-wire, ac, 120-v, shock.....	4	1	3	13	8	1	30
17	J44055 Genr set, gas-eng, 1.5-kw, dc, 28-v, shock.....	2	0	0	5	3	1	11
18	J45699 Genr set, gas-eng, 3-kw, 60-cy, 1—3-ph, 120/240-v 120/208-v, skid-shock.....	0	0	3	3	0	1	7
19	J47068 Genr set, gas-eng, 5-kw, 60-cy, 1—3-ph, ac, 120—240—120/208-v, skid-shock mtd.....	0	0	0	10	0	0	10
20	J74852 Grader, rd, mtg, diesel-driven, hv, 6x4, front-whl steering.....	0	0	2	0	0	0	2
21	K30645 Hel, obsn, OH-6A.....	8	0	0	0	0	0	8
22	P92030 Pump, cntrf, gas-driven, frame-mtd, 2-in, 125-gpm, 50-ft head.....	0	0	1	0	0	0	1
23	P96640 Pumping assy, flammable liq, bulk trf.....	3	0	0	5	1	0	9
24	S55393 Scooter mtr, rough terrain, 2-whl, with equip.....	0	0	0	0	0	2	2
25	S70517 Stlr, low-bed, 25-ton, 4-whl, with equip.....	0	0	2	0	0	0	2
26	T10138 Shop equip, contact maint, trk-mtd.....	0	0	1	1	0	0	2
27	V12141 Tk and pump unit, liq-dispensing, trk-mtg.....	0	0	0	1	0	0	1
28	V19950 Tk unit, liq-dispensing, tlr-mtg.....	0	0	1	1	0	0	2
29	W80789 Trac, FTRAC, low-spd, diesel, mdm, with angledozer, scarifier.....	0	0	2	0	0	0	2
30	W94030 Tlr, ammo, 1 1/2-ton, 2-whl, with equip.....	0	0	0	0	27	0	27
31	W94441 Tlr, basic, util, 2 1/2-ton, 2-sgl whl, with equip.....	0	0	3	0	0	0	3
32	W95400 Tlr, cgo, 1/4-ton, 2-whl, with equip.....	36	11	5	28	7	22	109
33	W95537 Tlr, cgo, 3/4-ton, 2-whl, with equip.....	14	4	1	33	15	7	74
34	W95811 Tlr, cgo, 1 1/2-ton, 2-whl, with equip.....	3	0	2	15	8	3	31
35	W98825 Tlr, tk, water, 400-gal, 1 1/2-ton, 2-whl, with equip	1	1	1	3	4	5	15
36	X38639 Trk, amb, 1/4-ton, 4x4, with equip.....	2	0	0	9	1	2	14
37	X39735 Trk, cgo, 3/4-ton, 4x4, with equip.....	13	3	0	30	15	7	68
38	X39872 Trk, cgo, 3/4-ton, 4x4, WWN, with equip.....	3	1	3	6	23	2	38
39	X39940 Trk, cgo, 1 1/4-ton, 6x6, with equip.....	4	0	0	0	4	5	13
40	X40009 Trk, cgo, 2 1/2-ton, 6x6, with equip.....	0	1	0	28	10	4	43
41	X40146 Trk, cgo, 2 1/2-ton, 6x6, WWN, with equip.....	4	2	3	2	50	4	65
42	X43434 Trk, dump, 2 1/2-ton, 6x6, WWN, with equip.....	0	0	18	0	0	0	18
43	X48914 Trk, lift, fork, diesel-driven, 6,000-lb cap.....	0	0	0	2	0	0	2
44	X59874 Trk, trac, 10-ton, 6x6, with midship winch, with low-mtd 5th whl, with equip.....	0	0	2	0	0	0	2
45	X60833 Trk, util, 1/4-ton, 4x4, with equip.....	45	28	5	29	47	23	177
46	X61244 Trk, util, 1/4-ton, 4x4, carr for 106-mm rifle, with equip.....	0	0	0	0	0	8	8
47	X63025 Trk, wkr, crane, 2 1/2-ton, 6x6, WWN, with equip..	0	0	0	0	1	0	1
48	X63299 Trk, wkr, 5-ton, 6x6, WWN, with equip.....	0	0	0	3	0	0	3
49	Y35486 Water purification equip set, trk-mtd, diatomite- fil, 1,500-gph (army).....	0	0	1	0	0	0	1

Section V. ENGINEER AMPHIBIOUS UNITS

1-17. General

a. Engineer amphibious units are designed to provide personnel and units for performance of combat and combat support missions, when suitably augmented, and interim combat service support functions as part of an Army force executing assault landing operations. These amphibious units, whose specific capabilities are listed in paragraph 1-18, are employed in joint or unilateral operations in support of combat forces conducting ship-to-shore or major water-barrier crossing operations.

b. Engineer amphibious units provide the following support:

(1) The engineer amphibious unit commander and commanders of shore party components serve as special staff assistants to the Army landing force commander and commanders of subordinate landing force echelons during planning for the amphibious attack.

(2) Engineer amphibious units provide command, control, and limited combat engineer support for battalion, brigade, division, and corps landing team shore parties. However, engineer amphibious units are supplemented with other combat support and combat service support units to provide shore parties to meet a specific tactical situation.

(3) Engineer amphibious assault units provide a means of ship-to-shore or shore-to-shore movement and cross-country mobility to assault landing teams. The use of amphibians, which provide both armor protection and mobility, makes possible a rapid, continuing movement to relatively deep initial objectives without delay at the landing beach. Amphibians also can deliver critical supplies direct to assaulting inland elements and expedite the evacuation of medical patients and prisoners of war without transfer on the beaches. To maintain an amphibious capability, amphibious vehicles in a combat service support role should be replaced by tracked carriers and wheeled vehicles as soon as practicable.

c. The table of organization and equipment (TOE) organizations of engineer amphibious elements are designed to operate either as control headquarters or in direct support of an amphibious operation. Engineer amphibious companies are allocated to an amphibious task force both in type and number in accordance with the anticipated tactical situation. The following data, representing the best data currently available, are based on FM 5-144 and recommended TOE plans.

1-18. Engineer TOE Shore Party Units

a. The engineer amphibious brigade coordinates and controls corps beach support area development initiated by multiple divisions or assumes control and substantially expands the beach support area development accomplished by a single assaulting division. It also provides the command and staff required to control the corps shore party and from one to four attached engineer amphibious groups.

b. The engineer amphibious group coordinates and controls beach support at division and provides the command and staff required to control the division shore party and from one to three engineer amphibious battalions, depending on the tactical situation.

c. The engineer amphibious battalion provides the command and control for the shore party of a brigade-size landing force during amphibious or shore-to-shore operations and further provides tactical amphibious mobility for dismounted combat units in the passage of water barriers. It consists of a headquarters and headquarters company, one engineer amphibious company, and two engineer amphibious assault companies.

d. The composition of the three echelons of shore parties is illustrated in a typical shore party troop list (table 1-31), which is based on two assault divisions landing abreast. Table 1-31 shows organization, and tables 1-32 and 1-33 list major items of weapons and missiles, vehicles, and equipment.

Table 1-31. A Typical Shore Party Troop List

1	2	3	4	5
Unit	TOE	Per BDELT	Per div	Per corps
<i>Engr amph units</i>				
2 HHC, engr amph bde.....	5-401G			1
3 HHC, engr amph gp.....	5-402G		1	2
4 Engr amph bn.....	5-405G	1	2	4
<i>Cbt spl units</i>				
5 HHC, engr cbt bde, corps.....	5-101G			1
6 HHC, engr cbt gp.....	5-52G		1	2
7 Engr cbt bn.....	5-35G	1	2	4

Table 1-31—Continued

1	Unit	2 TOE	3 Per BDELT	4 Per div	5 Per corps
8	Engr pl const spt co.....	5-177G		1	2
9	Engr pl const spt co plat.....	5-177G	1		
10	HHD, sig gp.....	11-122G			1
11	Corps sig bn.....	11-15G			1
12	CO opns co, corps sig bn.....	11-17G			2
13	CO opns co, corps sig bn plat.....	11-17G	1		
14	Fld op co.....	11-18D		1	
15	Fld op co plat.....	11-18D	1		
16	HHD, cml smoke genr bn.....	3-266G		1	2
17	Cml smoke genr co.....	3-267G	1	4	8
<i>Cbt svc spt units (COSCOM)</i>					
18	HHC, corps spt bde.....	54-22G		1	1
19	HHC, spt gp.....	29-102G	1(-)	1	2
20	Stk con co, spt bde.....	29-404T		1(-)	1
21	Avn mdm hel co.....	1-258G		1	2
22	Avn mdm hel co plat.....	1-258G	1		
23	HHD, TMT gp.....	55-12G			1
24	HHD, TMT bn.....	55-16G		1	2
25	Trans lt-mdm trk co.....	55-67G	1	1	3
26	Trans car co.....	55-19G			1
27	Trans car co plat.....	55-19G		1	
28	Trans hv trk co.....	55-28G			1
29	Trans hv trk co plat.....	55-28G	1	1	
30	Trans lt trk co.....	55-17G			1
31	Trans lt trk co plat.....	55-17G		1	
32	Trans tml trf co.....	55-118G			1
33	Trans tml trf co plat.....	55-118G		1	
34	HHD, trans tml bn.....	55-116E		1	2
35	Trans lt amph co.....	55-138G		1	2
36	Trans lt amph co plat.....	55-138G	1		
37	Trans TS co.....	55-117G		1	4
38	Trans acft DS co.....	55-457G		1	2
39	HHD, med gp.....	8-122G		1	1
40	HHD, med bn.....	8-126G	1		2
41	MASH.....	8-571G		1	2
42	Evac hosp.....	8-581G		1	4
43	Med coll co.....	8-129G	2(-)	1	1
44	Med clr co.....	8-128G		1	2
45	Med clr co plat.....	8-128G	1		
46	Med amb co.....	8-127G		1	2
47	Med sup det (FB).....	8-500G		1	
48	Med sup det (FC).....	8-500G			1
49	Med det, hel amb (RA).....	8-500G		1	2
50	Prof svc tms.....	8-500G		As rqr	As rqr
51	HHC, ord ammo DS/GS gp.....	9-22G			1
52	HHC, ammo bn.....	9-36G		1	2
53	Ammo co, convl.....	9-38G		1	3
54	Ammo co, convl, sec.....	9-38G	1	1(-)	2
55	Ord GM GS co.....	9-227E			1
56	Ord GM GS co plat.....	9-227E		1	
57	EOD det.....	9-500D	1	1	3
58	HHD, MP gp.....	19-272G			1
59	HHD, MP bn.....	19-76G		1	1
60	MP co.....	19-77G	1(-)	2	4
61	MP phys scty co.....	19-97G			1
62	MP ESCRG co.....	19-47G		1	1
63	MP det, crim inves.....	19-500E			1
64	HHD, CA gp, with func tms.....	41-500G			1
65	HHD, CA co, with func tms.....	41-500G		1	
66	Sig small HQ op co.....	11-147G		1	
67	Pers svc co (type F).....	12-67G		2	4
68	Per svc co (type D).....	12-67G	1		
69	APU (AB, FB, 3 HB).....	12-550G	1		
70	APU (AB, FB, FC, 8 HB).....	12-550G		2	

Table 1-31—Continued

1	2	3	4	5
Unit	TOE	Per BDELT	Per div	Per corps
71 APU (AB, 4 FC, 4 HC).....	12-550G			4
72 Fin DS co.....	14-17G	1	2	4
73 Lt maint co, DS.....	29-207G	1	1	3
74 HHD, maint DS or GS bn.....	29-136G	1	1	3
75 Hv equip GS maint co.....	29-137G	1	1	3
76 Coll and clas co.....	29-139G			1
77 LE GS maint co.....	29-134G			2
78 HHC, S&S GS bn, fwd.....	29-116G	1	1	2
79 Gen sup GS co, fwd.....	29-118G		1	3
80 Gen sup GS co plat, fwd.....	29-118G	1		
81 Rep parts GS co, fwd.....	29-119G		1	2
82 Rep parts GS co, plat, fwd.....	29-119G	1		
83 Fld svc GS co, fwd.....	29-114G		1	2
84 Petrl sup co.....	10-227G		1	
85 HHC, petrl op bn.....	10-206G			1
86 Petrl op co.....	10-207G			1

Table 1-32. Engineer Amphibious Units—Weapons and Missiles

1	2	3	4	5	6	7	8
LIN	Nomenclature	5-401G HHC, bde	5-402G HHC, gp	5-406G HHC, bn	5-407G Aslt co	5-408G Amph co	Amph bde total
2 L92386	Mg, 7.62-mm, lt, flex.....	1	3	4	0	4	82
3 M75714	Mount, tripod, mg, 7.62-mm.....	1	3	4	0	4	82
4 N96741	Pistol, cal. 45, auto.....	23	16	66	99	10	2537
5 R95114	Rifle, 7.62-mm.....	80	66	191	28	159	3932
6 R95251	Rifle, 7.62-mm, auto, with bipod.....	7	7	8	8	12	352

Table 1-33. Engineer Amphibious Units—Vehicles and Major Operational Equipment

1	2	3	4	5	6	7
LIN	Nomenclature	5-401G HHC, engr amph bde	5-402G HHC, engr amph gp	5-406G HHC, engr amph bn	5-407G Engr amph aslt co	5-408G Engr amph co
2 D89675	Chamber, recompression, divers, 100-psi.....	0	0	1	0	0
3 F56577	CEV, FTRAC.....	0	0	0	0	2
4 F39378	Crane, whl-mtd, 20-ton, ¾-cu yd, rough terrain.....	0	0	0	0	2
5 G32473	Living equip set 1-person, scuba, open-ckt.....	0	0	6	0	0
6 L37030	Ldg veh, tracked, engr.....	0	0	10	0	0
7 L37118	LVTP.....	0	0	0	30	0
8 L37122	LVTP, comd.....	0	0	6	0	0
9 L37132	Ldg veh, tracked, recov.....	0	0	0	1	0
10 L67234	Lighter, amph, SP, 2 ½- to 5-ton.....	0	0	0	0	4
11 P11866	Pneu tool and compressor outfit, 250-cfm, tlr-mtd.....	0	0	0	0	1
12 S70517	Stlr, low-bed, 25-ton, 4-whl, with equip.....	0	0	0	0	4
13 S70791	Stlr, low-bed, 60-ton, 8-whl, with equip.....	0	0	2	1	0
14 T10138	Shop equip, contact maint, trk-mtd.....	0	0	3	0	2
15 T13152	Shop equip, org rep, lt, trk-mtd.....	0	0	1	0	0
16 W31223	Tool set, amph lighter, LARC-V, org maint.....	0	0	0	0	1
17 W94441	Tlr, bsc util, 2 ½-ton, 2 sgl whl, with equip.....	0	0	0	0	6
18 W95400	Tlr, cgo, ¼-ton, 2-whl, with equip.....	16	9	15	1	6
19 W95537	Tlr, cgo, ¾-ton, 2-whl, with equip.....	9	13	16	1	12
20 W95811	Tlr, cgo, 1 ½-ton, 2-whl, with equip.....	5	5	8	1	6
21 W98825	Tlr tk, water, 400-gal, 1 ½-ton, 2-whl, with equip.....	1	1	1	1	1
22 X39735	Trk, cgo, ¾-ton, 4x4, with equip.....	10	0	9	0	0
23 X39872	Trk, cgo, ¾-ton, 4x4, WWN, with equip.....	0	13	9	2	13
24 X40009	Trk, cgo, 2 ½-ton, 6x6, with equip.....	6	3	9	0	0
25 X40146	Trk, cgo, 2 ½-ton, 6x6, WWN, with equip.....	1	3	3	4	4
26 X43845	Trk, dump, 5-ton, 6x6, WWN, with equip.....	0	0	0	0	11
27 X59052	Trk, trac, 2 ½-ton, 6x6, with equip.....	0	0	2	0	0
28 X59189	Trk, trac, 2 ½-ton, 6x6, WWN, with equip.....	0	0	0	1	1
29 X59600	Trk, trac, 10-ton, 6x6, with dual midship winch, with high-mtd 5th whl, with equip.....	0	0	2	1	0
30 X59874	Trk, trac, 10-ton, 6x6, with midship winch, with low-mtd 5th whl, with equip.....	0	0	0	0	4
31 X60833	Trk, util, ¼-ton, 4x4, with equip.....	16	9	15	1	6
32 X63299	Trk, wkr, 5-ton, 6x6, WWN, with equip.....	0	0	2	0	0

Section VI. SPECIAL FORCES, GROUP, AIRBORNE

1-19. The Role of Special Forces

The role of the special forces is to contribute to the accomplishment of whatever missions and responsibilities are assigned to the U.S. Army. Therefore, the special forces group is a multipurpose force that, by organization, flexible command arrangements, adjusted logistic and fiscal procedures, and specially trained personnel, can address a variety of missions. As the organization within the Army responsible for unconventional warfare (UW), special forces are prepared to assume UW missions during any type of conflict. Since the option for UW is selective, special forces are able to employ these specially trained assets on other appropriate missions that contribute to the Army's overall mission.

1-20. The Capabilities of the Special Forces Group

a. General. Special forces groups are the major TOE units within the U.S. Army Special Forces and provide command, control, administration, and support for assigned and operational detachments. The special forces group can provide flexible responses to both strategic and tactical missions. It can undertake a variety of tasks and missions in many modes and configurations; under circumstances and in environments not customarily envisioned for regular forces; and, most importantly, in all levels of conflict. Special forces may participate either in a primary role or in a supporting role in conjunction with other forces or agencies. Deployment for operations may in-

volve only selected individuals or detachments with specific capabilities, or it may require one or more special forces groups.

b. Organization. Figure 1-15 shows the organization for the airborne special forces group.

c. Mission and Capabilities.

(1) *Mission.* As a multipurpose force, special forces' missions range from UW to advisory/training duties in preventive insurgency circumstances.

(2) *Capabilities.* Special forces can —

(a) Infiltrate and exfiltrate hostile areas by air, land, or sea.

(b) Operate in remote areas and hostile environments for a long time with a minimum of external direction and support.

(c) Plan and conduct military operations including, but not restricted to —

1. Developing, organizing, equipping, training, and directing indigenous forces in guerrilla warfare.

2. Participating in evasion and escape operations.

3. Other UW missions, either unilaterally or in conjunction with indigenous resistance forces.

4. Training, advising, and assisting indigenous military or paramilitary forces, to include operational, logistic, and fiscal support.

5. Performing intelligence, reconnaissance, and surveillance missions in remote or hostile areas, by underwater infiltration, long-range patrols, and free-fall parachute infiltration.

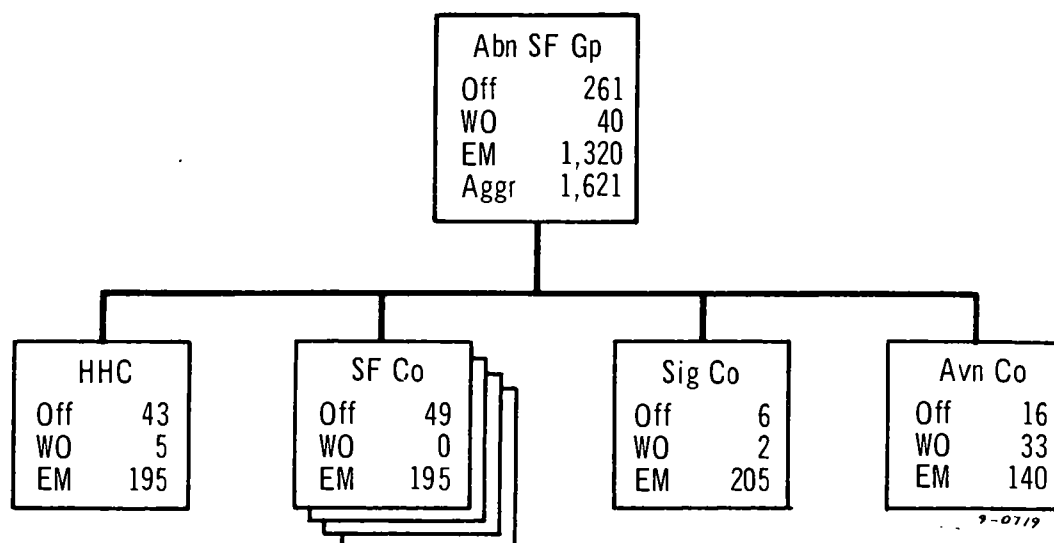


Figure 1-15. Airborne special forces group.

6. Attacking critical targets in remote, urban, or hostile areas.

7. Recovering friendly personnel from remote, urban, or hostile areas.

8. Training U.S. personnel in special forces' operational techniques that have utility in conventional force operations.

9. Planning assistance to other forces and agencies in connection with special forces' activities.

3. *Equipment.* FM 31-21, FM 31-21A, and FM 31-22 contain further details. Table 1-34 lists major items of weapons, vehicles and equipment.

Table 1-34. Airborne Special Forces Group—Weapons, Vehicles, and Vehicular Equipment

1	2	3	4	5	6	7
LIN	Nomenclature	31-106G HHC	31-107G SF co	1-307G Avn co	11-247G Sig co	31-105G Abn SF gp total
2	A30621 Airplane, util, U-1A	0	0	4	0	4
3	A30971 Airplane, util, STOL, U-10A	0	0	4	0	4
4	A71438 Antenna, AT-784/PRC	0	0	1	0	1
5	A90117 Armt, subsys, hel, 7.62-mm mg, lt	0	0	8	0	8
6	D79729 Central ofc tt, AN/MGC, less pwr	0	0	0	1	1
7	E59767 Comm central, AN/TSC-26	0	0	0	2	2
8	E92915 Con rdo set, AN/GSA-7	0	0	0	5	5
9	J35424 Genr set, diesel eng, tlr-mtd, 15-kw, 60-cy, 3-ph, ac, 120/208-240/416-v, PU-402/M	0	0	1	0	1
10	J41178 Genr set, gas-eng, tlr-mtd, PU-290/MR	0	0	4	0	4
11	J41931 Genr set, gas-trlr-mtd, PU-456/G	0	0	1	0	1
12	J42000 Genr set, gas-eng, tlr-mtd PU-474/U	0	0	0	11	11
13	J42959 Genr set, gas-eng, 0.5-kw, 60-cy, 1-ph, ac, 120-v, shock	0	0	1	0	1
14	J43918 Genr set, gas-eng, 1.5-kw, 60-cy, 1 ph, 2-wire, ac, 120 v, shock	6	0	6	1	13
15	J44055 Genr set, gas-eng, 1.5-kw, dc, 28-v, shock	0	0	1	0	1
16	J45699 Genr set, gas-eng, 3-kw, 60-cy, 1-3-ph, 120/240-v 120/208-v, skid-shock	1	0	0	1	2
17	J46178 Genr set, gas-eng, 3-kw, dc, 28-v, whl-mtd	0	0	3	0	3
18	K31767 Hel, util, UH-1C	0	0	4	0	4
19	K31786 Hel, util, UH-1D	0	0	8	0	8
20	K90188 Inst rep shop, trk-mtd, 2 1/2-ton, 6x6, with equip	0	0	2	0	2
21	L44575 Lchv, gren, 40-mm	0	30	8	0	128
22	L92260 Mg, 7.62-mm, acft, lt, door-mtd	0	0	8	0	8
23	L92386 Mg, 7.62-mm, lt, flex	0	0	2	0	2
24	M01648 Maint kit, elct equip, MK-733/ARC-54	0	0	1	0	1
25	M60076 Mod kit, elct equip, MK-345/GR	0	0	3	0	3
26	M75714 Mount, tripod, mg, 7.62-mm	0	0	2	0	2
27	N20114 Op cen, comm, AN/MSC-31	1	0	0	2	3
28	N20662 Op central, AN/MSC-32	0	0	0	3	3
29	P27799 Pwr-plant, elec, AN/MJQ-4	0	0	0	4	4
30	P40917 Pwr sup, RA-87	0	0	0	1	1
31	Q33089 Rdo set, AN/GRC-106 mtd in trk, 1/4-ton	0	0	3	5	8
32	Q33337 Rdo set, AN/GRC-109	0	32	0	0	128
33	Q37005 Rdo set, AN/PRC-25	0	32	3	0	131
34	Q38296 Rdo set, AN/PRC-74	0	0	0	50	50
35	Q42092 Rdo set, AN/URC-10	0	32	24	0	152
36	Q50754 Rdo set, AN/VRC-24 mtd in trk, 3/4-ton, cgo	0	0	1	0	1
37	Q54618 Rdo set, AN/VRC-47 mtd in trk, 1/4-ton	0	0	3	0	3
38	Q54692 Rdo set, AN/VRC-47 mtd in trk, 3/4-ton, cgo	0	0	1	0	1
39	Q78282 Rdo set con gp, AN/GRA-39	0	0	2	0	2
40	Q78419 Rdo set con gp, OA-1754/GRC	0	0	1	0	1
41	Q90100 Rdo tt set, AN/GRC-122	0	0	1	0	1
42	R91244 Revolver, cal .38, 4-in bbl	24	266	75	4	1167
43	R95114 Rifle, 7.62-mm	0	243	0	0	972
44	S73531 Stlr, van, cgo, 6-ton, 2-whl, with equip	0	0	2	0	2
45	T21509 Shop set, acft maint, stlr-mtd, B-1, tool crib, flow detection DS	0	0	1	0	1
46	T21646 Shop set, acft maint, stlr- and tlr-mtd, B-2 elec inst, and hyd, DS	0	0	1	0	1
47	T21783 Shop set, acft maint, stlr-mtd, B-3, sheet metal and welding, DS	0	0	1	0	1

Table 1-34—Continued

1	2	3	4	5	6	7
LIN	Nomenclature	31-106G HHC	31-107G SF co	1-307G Avn co	11-247G Sig co	31-105G Abn SF gp total
48	T21920 Shop set, acft maint, stlr-mtd, B-4 mach and eng shop, DS...	0	0	1	0	1
49	T22057 Shop set, acft maint, stlr-mtd, B-5, prop and rotor, DS.....	0	0	1	0	1
50	T23564 Shop set, acft maint, tlr-mtd, B-6, paint shop, DS.....	0	0	1	0	1
51	U81707 Swbd, tel, manual, SB-22/PT.....	0	0	1	5	6
52	V31211 Tel set, TA-312/PT.....	0	0	12	86	98
53	V39502 Tt set AN/FGC-20X.....	0	0	0	2	2
54	V41968 Tt set, AN/GGC-3.....	0	0	0	2	2
55	V57161 Tml tg, AN/GGC-3.....	0	0	0	1	1
56	W95400 Tlr, cgo, ¼-ton, 2-whl, with equip.....	6	0	9	6	21
57	W95537 Tlr, cgo, ¾-ton, 2-whl, with equip.....	3	0	6	2	11
58	W95811 Tlr, cgo, 1 ½-ton, 2-whl, with equip.....	4	0	7	11	22
59	W98825 Tlr, tk, water, 400-gal, 1 ½-ton, 2-whl, with equip.....	1	0	2	1	4
60	X39735 Trk, cgo, ¾-ton, 4x4, with equip.....	3	0	2	1	6
61	X39872 Trk, cgo, ¾-ton, 4x4, WWN, with equip.....	0	0	5	1	6
62	X40009 Trk, cgo, 2 ½-ton, 6x6, with equip.....	9	0	5	26	40
63	X40146 Trk, cgo, 2 ½-ton, 6x6, WWN, with equip.....	1	0	5	3	9
64	X57271 Trk, tk, fuel-svc, 2 ½-ton, 6x6, with equip.....	0	0	4	0	4
65	X59189 Trk, trac, 2 ½-ton, 6x6, WWN, with equip.....	0	0	1	0	1
66	X59326 Trk, trac, 5-ton, 6x6, with equip.....	0	0	2	0	2
67	X59463 Trk, trac, 5-ton, 6x6, WWN, with equip.....	0	0	2	0	2
68	X60696 Trk, trac, wkr, 5-ton, 6x6, WWN, with equip.....	0	0	1	0	1
69	X60833 Trk, util, ¼-ton, 4x4, with equip.....	6	0	9	6	21
70	X63299 Trk, wkr, 5-ton, 6x6, WWN, with equip.....	1	0	0	0	1
71	Z76282 Smg, 5.56-mm.....	217	189	114	209	1296



CHAPTER 2

COMBAT AND COMBAT SUPPORT—OPERATIONS AND INTELLIGENCE

Section I. TROOP PLANNING

2-1. Introduction

a. General. The mission; the character, disposition, and capabilities of the enemy; the characteristics of the area of operations (to include terrain, climate, population, natural resources, and manmade works); the availability of troops or units or both; and the availability of transportation, supplies, and equipment determine the numbers and types of units for employment in a given operation.

b. Basic Steps in Troop Requirement Planning.

(1) The following general steps are essential in accomplishing sound troop requirement planning:

(a) Determination of the functions or tasks to be performed.

(b) Determination of quantitative workload.

(c) Selection of type of operating unit, with capability required.

(d) Calculation of number of operating units required.

(e) Provision for command and control.

(2) Accomplishment of the steps listed in (1) above requires each member of the staff, in light of his responsibilities and the factors that affect mission accomplishment, to study the overall mission in detail.

c. Planning Procedures. Troop requirement planning passes through three phases—estimation, calculation, and modification. The planner must accomplish the first phase, particularly in the case of the establishment of a new theater with few, if any, tangible figures. He develops each successive phase with more concrete and accurate data than available in the preceding phase until a balanced, sound troop list evolves.

(1) *Phase I planning—estimation.* The planner must accomplish the initial step in the development of troop requirements with little specific data—often he has no more than a brief statement of the overall strength of the force to be employed or the number of divisions around which the force is to be built. Each planner uses broad experience factors, such as division and air wing slices, troop and equipment densities, and replacement and consumption (R&C) factors. For example, when the total troop strength is unknown, the planner can estimate by using appropriate division and air wing slices. From this

figure and from basic vehicle density factors, he can estimate the number of vehicles in the force. The planner derives other data in a similar fashion. The margin of error will depend partly on the accuracy of the factors he uses. He should use factors representing the best available experience and refrain from changing factor values unless he has the experience and background to make such changes valid.

(2) *Phase II planning—calculation.*

(a) Phase II planning begins when the planner receives phase I estimates in the form of initial, tentative troop lists. He can derive troop strengths and equipment lists for the force from these initial lists. These troop lists should be more accurate than the estimates used to initiate planning in phase I. The margin of error between these initial lists and those finally accepted will depend not only on the adequacy of the planning factors and guidance available to the troop requirement planners, but also on the experience, aptitude, and judgment of the individual planner. At the review level, general staff troop planning officers should carefully examine lists of the arms and services to determine whether the lists comply with guidance provided in the campaign plan scenario. In cases where branch strength requirements are largely dependent on total force strength, these planners should question any significant deviation from currently accepted percentages. However, environmental conditions, cultural development, and periods of time available for the buildup, to include force deployment and base development, are seldom identical in different campaign scenarios. Certain types of troop strength requirements are highly sensitive to factors other than total force in the theater. For example, a given campaign plan scenario indicates that peak requirements for logistic support of operations will occur at a particular phase of the campaign, e.g., on initiation of the offensive at D + 90 days. Presumably, the airfields; roads; ports; terminals; and storage, maintenance, and other facilities needed to maintain the planned volume of logistic support will require approximately 12 construction battalion (CB) months to accomplish. If work were to start on D-day, four engineer CB could do the work if they were in the theater. However, if the battalions were scheduled for deployment into the theater at 10-

day intervals starting at D + 10 days, the task would require eight engineer CB.

(b) Each planner reviews the consolidated initial troop list and decides, based on the new information therein, whether his next revision will increase or decrease and to what extent. The general staff planning officers should appraise each planner's predictions for accuracy and recalculate the first revised troop list accordingly. The general staff planning officers then furnish this information to all other planners so that each will be aware of the direction and limits of applicable changes.

(c) When this information is available, the planners continue phase II planning by preparing revised estimates. They discard the division slice and other factors suitable only for initial estimation in favor of actual (or adjusted) figures extracted from the initial lists. They may make several revisions before they can balance lists with one another. Intelligent adjustment and careful prediction at each successive planning stage reduce the number of revisions necessary to arrive at a calculated, balanced troop list to complete phase II.

(3) Phase III planning — modification.

(a) The consolidated troop list produced in phase II provides a balanced force, each element of which can perform its mission without modification. The planner then applies the modifications, adaptations, or alterations that policy, command direction, or conditions peculiar to the theater under consideration dictate in phase III.

(b) For example, the planner may substitute indigenous labor for military personnel at this stage.

1. The substitution of indigenous labor for military personnel will immediately throw the troop list out of balance, possibly requiring several successive revisions such as those made in phase II to balance it. This substitution will affect various services differently, e.g., the impact on maintenance units will be relatively minor because the equipment density will not change significantly; but the impact on the medical troop list will be substantial because medical service is provided primarily on the basis of military strength. Other services will be affected to a greater or lesser extent depending on the change in military strength and equipment required.

2. Because substitution of indigenous labor for military personnel in phase III will cause an imbalance and make additional revisions necessary, the planner should consider making such substitutions earlier in the planning process. Earlier substitution will simplify matters for

services, such as medical, interested primarily in military strengths; but it will complicate matters for those services that must prepare lists of equipment for the indigenous labor force. The chief of the planning group decides the procedures; but the various combat service support representatives should present the advantages and disadvantages of each method and make an appropriate recommendation in each case. One hundred-percent military troop lists against which planners can make augmentations and comparisons are desirable.

(c) Planners frequently impose arbitrary personnel ceilings on the combat service support elements. Planners should not apply these ceilings until phase III because the reduction in strength may not be proportional for all services or for all units within a service. If the planner knows the full military strength required to accomplish a mission, he can adequately appraise the effects of a reduced strength and report them to the head of the planning staff and force commander.

(d) The planner makes final distribution of troops by zone or area and determines the location of depots and other major installations in phase III. If the planner has tentatively accomplished the foregoing for each troop list prepared in phases I and II, he should find the final determination simple because of his increasing awareness of the deployment of troops of other arms and services throughout the theater and his adjustment of his own distribution to meet the probable load.

2-2. Troop Requirements—Typical Field Army

a. *General.* Tables 1-1 through 1-4 indicate the numbers and types of units that might be found in a dual-capable (capable of fighting in nuclear and nonnuclear environment) typical field army operating under conditions of general war.

b. *Organization.* This typical field army has three corps composed of one infantry division, one armored division, and two infantry (mechanized) divisions each. Table of organization and equipment (TOE) designations shown are either current, approved types of those that the Department of the Army has officially designated as proposed or tentative. Emphatically, the tables purport only to illustrate the many and various types of divisional and nondivisional units that a commander may employ in the field and the principles of organization of these units. The tables do *not* attempt to depict an organization for the conduct of operations in a specific situation or to connote in any way that they compose a typical force in the field. Actually, the composition or size

of forces in the field army will depend on the assigned missions and the requirements of locale and forms of conflict.

2-3. Troop Requirements—Theater Army Support Command

a. Mission. The theater army support command (TASCOM) provides combat service support to Army forces in a theater of operations and to other forces as designated. Services include —

- (1) General support to the field army.
- (2) Direct and general support in the communications zone (COMMZ).
- (3) Rear area protection (RAP) and area damage control in the COMMZ.

b. Functions. The TASCOM performs combat service support functions including administration, civil affairs (CA), construction, maintenance, medical, military police (MP), movements, personnel, legal, field services, comptroller and finance, supply, and transportation.

c. Organization. The TASCOM can support the following forces:

- (1) U.S. Army elements of joint, unified, or combined headquarters and units.
- (2) Theater army headquarters.
- (3) Army group headquarters (when used).
- (4) One or more field armies consisting of eight to 12 divisions each.
- (5) Theater army air defense command (TAADC).
- (6) Theater army civil affairs command (TACAC) (when used).
- (7) Theater army military intelligence (MI) group (when used).
- (8) Theater army reserve units.
- (9) United States Army Strategic Communications Command (USASCC) (theater).
- (10) TASCOM units.
- (11) United States Army Security Agency (USASA) units.
- (12) Other U.S. Army units located in or passing through the COMMZ.
- (13) Psychological operations (PSYOP) group.
- (14) Other U.S. Military Services, U.S. Government agencies, allied military forces, and civilian populations as the theater army commander may designate.

d. Subordinate Commands. The TASCOM normally has the following major subordinate commands:

- (1) Area support command (ASCOM).
- (2) Engineer command (ENCOM).
- (3) Medical command (MEDCOM).
- (4) Personnel command (PERSCOM).

(5) Supply and maintenance command (SMCOM).

(6) Transportation command (TRANSCOM).

2-4. Troop Requirements—Airborne Operations

a. General.

(1) The mission, characteristics of the objective area, enemy dispositions and capabilities, and probable length of time that the air lines of communications will support the airborne force are among the pertinent factors that determine the troop requirements for an airborne force. The complete dependence of an airborne force on a single communications system — air line of communications — until establishment of linkup requires the planner to carefully determine troop requirements for each airborne operation.

(2) Normally, the troop list for the Army component of an airborne force includes those units that will directly participate in the operation in a combat or a supporting role. It does not include units required to support the marshaling of the Army forces or the combat service support that the TASCOM agency designated may furnish to mount and support the airborne operation.

(3) The number of airborne divisions and corps allocated to theaters of operations will vary. The Department of the Army, based on Joint Chiefs of Staff directives, furnishes such units.

(4) The Army component of an airborne force usually is responsible for its own combat service support in the airborne objective area, regardless of the size or composition of the Army forces. Therefore, the troop list for the Army component of an airborne force will contain sufficient combat service support troops to provide combat service support in the airborne objective area. In all airborne operations the planner carefully considers the combat service support that units in the departure area will provide Army forces in the objective area. He will use this information to the maximum permitted by the characteristics of the operation that he is planning. Usually, the nature of the service that the units concerned provide will determine their assignment to the Army component of the airborne force or to the TASCOM supporting the operation. Normally, the number of Army combat service support troops required by an airborne force in an objective area will be considerably less than the number required by a ground force containing the same number of divisions.

b. Employment of TOE Units. The same types of nondivisional combat service support troops

shown for the typical field army in chapter 1 will support airborne divisions, infantry divisions, corps, and field armies used in airborne operations. The number of supporting units will be the minimum to provide only the requirements of the specific force being organized. Frequently, the strength and organic equipment of a supporting unit are reduced to improve its air transportability. Lighter equipment may substitute for heavy equipment. Because of the inherent differences between ground and airborne operations, many of the support units shown in chapter 1 may be omitted from the airborne troop list, while others may be assigned to the TASCOM troops supporting the airborne operation. A portion of those units assigned to the Army component of the airborne force may operate in the objective area, while others support the operation in the departure area.

c. Employment of Special Units. Special units or TOE units with special training and equipment are required for certain airborne operations, particularly independent operations.

(1) Specifically structured, trained, and equipped engineer units organized primarily around the engineer light equipment company and the engineer combat battalion (army) are required to rehabilitate airfields or to construct air-landing facilities.

(2) Specially organized, trained, and equipped units provide air terminal facilities in the objective area when aircraft will deliver large tonnages of supplies and equipment for a prolonged period. Normally, Air Force units will provide this terminal support. Army units, however, must clear the supplies from the terminal.

(3) The planner determines separately the numbers and types of the special units required for each airborne operation, based on such factors as the airfield repair and construction requirements in the objective area, the tonnage of supplies and equipment to be received in the objective area by air transportation, and the method of supply distribution that will be used on the objective area.

2-5. Troop Requirements—Airmobile Operations

a. General.

(1) The Army conducts airmobile operations in two ways: first it allocates aircraft to ground units for specific missions or periods of time; and second, it organizes, equips, and trains units that employ aircraft as the primary means of accomplishing their ground tactical mission, such as the airmobile division. In either instance, the planner

concerned with preparing a troop list for airmobile forces must be aware of the greatly increased logistic requirement needed to support this type of operation.

(2) Generally, the airmobile force troop list includes only those units that directly and habitually participate in airmobile operations. Other units, such as aircraft maintenance and petroleum supply units, should be provided in the troop list for the appropriate TASCOM agency.

(3) The airmobile force is responsible for its own combat service support in the objective area. Prior to linkup, combat service support is sustained through an air line of communications. This support may require attachment of additional combat service support units for employment in the objective area. This requirement is particularly applicable in the case of ground combat units employing attached aviation units to provide airmobility.

(4) The density of airmobile forces varies between theaters of operations. The theater commander recommends assignment of airmobile forces to Joint Chiefs of Staff and the Department of the Army furnishes such forces based on Joint Chiefs of Staff directives.

b. Employment of TOE Combat Support and Combat Service Support Units.

(1) Airmobile forces require the same types of combat support and combat service support as other forces in the typical field army, except that in the areas of aircraft maintenance, aviation POL, and aircraft armament ammunition, the requirements are greatly increased. Units providing this support may require modification in personnel structure or equipment authorization to improve their airmobility. Some units may operate in the objective area while others will operate in the departure area, forward supply bases, and forward refueling and rearming areas. Combat service support units provided in the TASCOM troop list will normally operate from a location in the theater COMMZ.

(2) The planner must determine the number and type of each combat support or combat service support unit required for each separate airmobile operation. He considers preparation of airfields, staging areas, forward supply, refueling and rearming areas, and landing zones in the objective area; the tonnages of supplies to be moved to these areas; and possibly the use of Air Force air transportation.

2-6. Troop Requirements—Amphibious Operations

a. Table 1-31 assists in determining typical shore party troop units in addition to those units

normally attached to an independent corps of two assault divisions landing abreast (col 5), an independent division landing force of two assault brigades landing abreast with one brigade following (col 4), and a brigade landing team (BDELT) (col 3) to provide balanced shore parties for amphibious operations. The factors used as a basis to determine the troop requirements can provide only an estimate. The planner must modify requirements to meet the peculiarities of a particular situation.

b. FM 5-144 contains details on shore party organization and planning.

2-7. Troop Planning Slices

a. *Purpose.* In administrative planning, a preliminary estimate of the total size of a force is required to determine the final composition and the ultimate size of the force. The required number of combat service support units, such as hospitals, depot units, etc., bears a direct relationship to the size of the total force. Two factors are used in planning for a large landmass army — the division slice and the air wing slice. To determine the preliminary total of the force, the planner —

(1) Multiplies the division slice by the number of divisions in the force.

(2) Adds the product to that of the air wing slice multiplied by the number of air wings in the force.

(3) Adds to this sum the various miscellaneous forces not included in either slice.

b. Definitions.

(1) *Division slice* — The strength of an average combat division plus proportionate shares of the total corps, field army, COMMZ, and continental United States (CONUS) (for worldwide slice only) units operating to the rear of the division (and of Navy units directly supporting the Marines in case of Marine divisions). The division slice for any given force is equal to the total strength of the force divided by the number of combat divisions in the force.

(2) *Air wing slice* — The strength of an average air wing plus a proportionate share of the Air Force and Army units engaged in developing or operating the airbases (and of Navy units that directly support the Marine or Navy air units).

(3) *Brigade slice* — The strength of an average separate brigade plus proportionate shares of the total combat support and combat service support units operating in the corps or other operational area.

c. *Relationship Between Division Slice and Air Wing Slice.* The 7,000-man air wing slice (fig.

2-2) includes about 1,000 Army COMMZ men not counted in a division slice. These 1,000 Army men are required for COMMZ support of Air Force units and installations present in the theater of operations. From the information in *a* and *b* above and figures 2-1 and 2-2, the planner makes this same assumption — the air wing slice, not the division slice, contains the COMMZ support for the Air Force. This allows troop planners to use the data in the figures below with varying ratios of air wings to army divisions in any specific force.

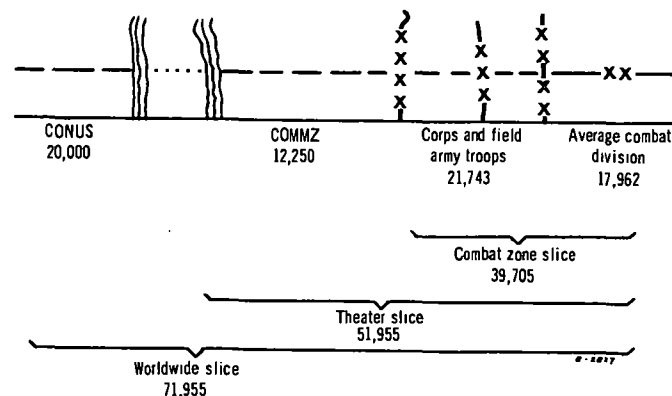


Figure 2-1. Division slice.

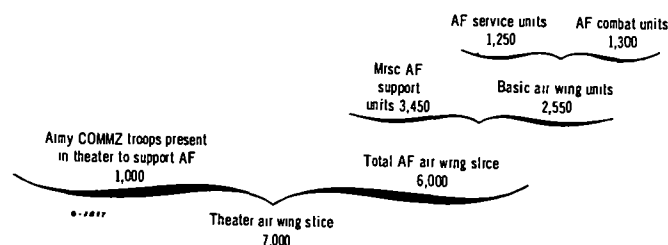


Figure 2-2. Air wing slice.

2-8. Division and Air Wing Slices

a. *Basic Slice Factors.* Table 2-1 shows the location and assignment of slice components, whereas figure 2-1 and figure 2-2 show the assignment of slice components only. The location and assignment factors are repeated in figure 5-1.

b. *Division Slice.* Table 2-2 presents the percentages of each arm, service, and other major grouping assigned to each part of a large balanced force. Its basis is the logical breakout of the combat support and combat service support units necessary to support a *typical* 12-division field army. All TOE strengths are from published or approved draft TOE's for field army units, as presented in tables 1-1 through 1-4. The COMMZ

percentages (col 5) do not include those Army COMMZ troops that must be present to support the Air Force (para 2-7c). Percentages in the CONUS portion of the worldwide slice (col 3) are those from previous editions of this manual.

c. *Air Wing Slice.* Table 2-3 presents the percentages of components, branches, and other major groupings present in the theater of operations. Its basis is a typical U.S. Air Force troop list and a typical Army force.

Table 2-1. Basic Slice Factors
a. Division Slice

	1	2	3	4	5	6
1	Composition of slice by assignment of troops		Percentage of slice		Composition of slice by location of troops	
	Assignment	Troops	Theater	Combat zone	Troops	Location
2	Basic division.....	17,962	34	45	24,265	Division area.
3	Corps and field army troops.....	21,743	42	55	15,440	Corps and field army rear areas.
4	Communications zone and theater overhead.....	12,250	24	-----	12,250	Communications zone.
5	Total.....	51,955	100	100	51,955	

b. Air Wing Slice

1		2	3	4	5
1	Composition of slice by assignment of troops		Percentage of slice	Composition of slice by location of troops	
2	Air Force combat organization	2,550	36	-----	Division area.
3	Miscellaneous Air Force support units	3,450	50	-----	Corps and field army rear areas.
4	Army communications zone troops*	1,000	14	7,000	Communications zone.
5	Total	7,000	100	7,000	

*Army troops required in the theater because of the presence of Air Force elements, which are provided Army combat service support.

Table 2-2. Division Slice—Major Grouping

1		2	3	4	5	6	7	8
		Worldwide slice (percentage)		Theater slice (Army) (percentage)		Combat zone slice (Army) (percentage)		
1	Branch or other major groupings	Total (71,955 men)	CONUS portion (20,000 men)	Total (51,955 men)	COMMZ portion (12,250 men)	Total (39,705 men)	Corps fld army and rear portion (21,743 men)	Average cbt div. only (17,962 men)
2	Cbt div-----	25.0	0.0	34.6	0.0	45.2	0.0	100.0
3	HQ, thtr, fld army, corps, TASCOM, FASCOM, spt bde, spt gp-----	3.8	9.5	1.7	4.5	0.8	1.4	0.0
4	Sep bde-----	0.7	-----	1.0	-----	1.3	2.4	0.0
5	Inf-----	0.8	0.4	1.0	-----	1.2	2.3	0.0
6	Armor-----	2.1	0.3	2.8	-----	3.7	6.7	0.0
7	Arty-----	7.1	1.6	9.2	-----	12.1	22.1	0.0
8	Avn (cbt spt)-----	0.5	-----	0.7	-----	0.8	1.5	0.0
9	Cml-----	0.4	0.2	0.5	0.3	0.6	1.0	0.0
10	Engr-----	8.5	4.0	10.2	14.3	8.9	16.2	0.0
11	Other cbt spt (intel, sig, USASA)-----	2.9	1.7	3.3	0.9	4.0	7.4	0.0
12	Ammo-----	1.5	0.4	1.9	3.5	1.4	2.6	0.0
13	Maint-----	5.1	1.4	6.5	7.9	6.0	10.9	0.0
14	Med-----	6.2	4.9	6.8	17.6	3.4	6.2	0.0
15	MP-----	2.5	0.9	3.2	9.8	1.0	1.8	0.0
16	S&S-----	5.7	2.6	6.8	14.8	4.3	8.0	0.0
17	Trans-----	6.2	5.0	6.7	16.3	3.7	6.7	0.0
18	Pers svc-----	1.2	-----	1.5	3.6	0.9	1.6	0.0
19	Other cbt svc spt-----	1.1	-----	1.6	6.5	0.7	1.2	0.0
20	Repl (CONUS)-----	6.4	23.0	0.0	0.0	0.0	0.0	0.0
21	Other CONUS-----	12.3	44.1	0.0	0.0	0.0	0.0	0.0
22	Total percentage-----	100.0	100.0	100.0	100.0	100.0	100.0	100.0
23	Percentage of worldwide slice-----	100.0	27.8	72.2	17.0	55.2	30.2	25.0
24	Percentage of thtr slice-----	-----	-----	100.0	23.6	76.4	41.8	34.6
25	Percentage of CZ slice-----	-----	-----	-----	-----	100.0	54.8	45.2

Table 2-3. Air Wing Slice—Major Grouping

1	2	3	4
Component, branch, or other major grouping	Theater total— 7,000 men (percentage)	Air Force total—6,000 men (percentage)	Basic air wing 2,550 men— (1,300 cbt) (1,250 svc) ¹ (percentage)
Air Force:			
2 HQ and overhead ²	(3.0)	(3.3)	
3 Cbt.....	18.6	21.7	51.0
4 Svc.....	17.9	20.8	49.0
5 Misc spt.....	49.2	57.5	
Army:			
6 COMMZ spt.....	14.3		
7 Total percentage.....	100.0	100.0	100.0
8 Percentage of air wing slice.....	100.0	85.7	36.4

¹ Located on the cbt airfield; includes all elements organic to wing.² Includes various Air Force headquarters and misc overhead units. Percentages in parentheses are included in total percentages of misc spt, line 5.

Section II. TACTICAL TROOP MOVEMENTS

2-9. Road Movement

a. Tactical Troop Movements. Tactical troop movements by land, air, and water, including foot and motor movements, are covered in this section. Administrative troop movements are covered in chapter 6.

b. Examples. The examples of forms for movement tables and graphs are guides for preparing similar tables for units in the field. Tables for field use must conform to the variations in strengths of units and the amount of transportation and equipment available. Brigades, separate battalions, and similar units should maintain tables showing length-of-column (LGTHCOLM) requirements of their units, based on actual strength and materiel on hand. Reports of subordinate units form the bases for tables of larger units. Brigade headquarters maintains tables of attached units. However, a table based on actual strength of men and materiel may be worthless without proper evaluation of the weather, road aspects, nuclear aspects, hostile air and mechanized threats, or other factors affecting the troop movement. These basic figures can be increased or decreased under extremes of the variable factors. In considering movement data under nuclear conditions, the planner should evaluate the relatively unprofitable target presented by a narrow, long column and the possibly high vulnerability of several columns along parallel routes at the same time. Troop movement data in the examples of tables of basic LGTHCOLM's and tables of rates and lengths of marches are averages from field experience.

c. Basic LGTHCOLM's. The following values apply in computing LGTHCOLM's except when greater dispersion is desired to reduce the effect of unfavorable factors, such as those mentioned in *b* above.

(1) Foot troops (at halt or marching):

	2 meters per man	5 meters per man
Single file, per man.....	2.4	5.4
Column of twos, per man.....	1.2	2.7

(2) Motor elements (at halt):

	Length of vehicle (meters)
Car, passenger.....	7
Armored personnel carrier.....	6
Tank.....	10
Tank with cargo carrier or weapon in tow.....	13
Tractor.....	7
Tractor with cargo trailer or weapon in tow.....	14
Tractor, 5-ton, with semitrailer, 15-ton, low-bed.....	28
Tractor, 10-ton, with semitrailer, tank, transporter, 50-ton.....	28
Trucks:	
1/4-ton.....	4
1/4-ton with cargo trailer or weapon in tow.....	8
3/4-ton.....	6
3/4-ton with cargo trailer or weapon in TOW.....	9
2 1/2-ton.....	8
2 1/2-ton with cargo trailer or weapon in tow.....	15
More than 2 1/2-ton.....	9
More than 2 1/2-ton with cargo trailer in tow.....	15
10-ton with 8-in howitzer.....	21
5-ton with 155-mm howitzer.....	15
Pershing, XM474, self-propelled.....	5
5-ton tractor with Sergeant, XM504.....	17
Average per vehicle for a mixed column of various types.....	10

(3) Use of values.

(a) A dismounted battalion of 800 men organized as four companies, totaling 19 platoons; company — 100 meters; platoon distances — 50 meters; formation — column of twos, 5 meters between men: LGTHCOLM = $800 \times 2.7 + 3 \times 100 + 15 \times 50 = 3,210$ meters.

(b) A mixed motor column consisting of—

	Meters
20 trucks, $\frac{1}{4}$ -ton, with weapons in TOW at 8 meters each.....	160
25 trucks, $\frac{3}{4}$ -ton, with trailer in TOW at 9 meters each.....	225
40 trucks, 2 $\frac{1}{2}$ -ton, with trailers in TOW at 15 meters each.....	600
40 tanks at 10 meters each.....	400
125 total	
Total LGTHCOLM at halt.....	1,385
Alternate solution ((2) above):	
125 vehicles (mixed) at 10 meters each.....	1,250

d. Halts (Motor March).

(1) Short halts.

(a) The commander controlling road movement over the route in question decides whether to observe routine short halts.

(b) A 15-minute halt normally is made at the end of the first hour. Thereafter, a 10-minute halt normally is made after each 110 minutes' running time.

(2) Long halts.

(a) One-half to 1 hour is allowed for mess and refueling stops. When other convoys must pass, the planner should schedule a mess and refueling halt to coincide with the passing, thus using the necessary delay to advantage.

(b) Long halts must be specifically authorized and plotted on movement graphs.

(c) FM 55-30 gives detailed information on operational road movement orders, tables, and graphs.

e. *Pass Times.* Figure 2-3 shows pass times (PST) of columns on foot, column of twos, 5 meters per man; it does not include column gaps (COLMGP).

f. *Rates and Lengths of Road Movements, Foot and Motor Elements.*

(1) *General.* The rates and lengths of marches in table 2-4 are based on modern vehicles, trained personnel, and favorable road and weather conditions. Hence, rates of march for motorized elements in columns 2 and 3 are possible only on improved roads. The rate of march of a column of elements with different rates of march is regulated by that of the slowest element. The rate of march represents the average speed over a period, including short, periodic halts. However, under forced march conditions, troops can cover greater distances than those given in column 6. For movements on foot over mountainous terrain, planners should allow an additional hour for each 300 meters of climb.

(2) *Road movements in snow and extreme cold.*

(a) *Foot.* Foot troops marching in snow

without snowshoes or skis have decreased mobility. This decrease depends on several factors, among which are depth and nature of the snow. Normally, snow of a depth of 64 centimeters or more will prohibit marching unless troops wear skis or snowshoes. For specially trained troops the following rates of march are practicable:

Snow—

shoes. $2\frac{1}{2}$ to 4 kilometers per hour

Skis. $2\frac{1}{2}$ to $5\frac{1}{2}$ kilometers per hour

Small bodies of well-trained troops are capable of moving 64 kilometers a day on skis under favorable conditions.

(b) Motor movement (wheeled) in snow.

Depth of snow (cm)	Measures required for movement
7.5.....	None
15.....	Rear chains
15-45.....	Chains all around and special traction devices on leading vehicles (to break the trail)
45 and more.....	Snowplow required

g. *Forced Marches of Foot Elements.* For planning purposes a normal foot march covers 32 kilometers per day at a rate of 4 kilometers per hour. A forced march requires the expenditure of more than the normal effort in speed, exertion, hours marched, or a combination of these. Forced marches are normally accomplished by increasing the number of hours marched rather than by increasing the rate of march. Commanders should take full advantage of those periods when the troops are most rested to increase the rate of march. Commanders should schedule rest periods so that troops will not be marching during the hottest time of the day and so they will arrive in effective fighting condition.

2-10. Motor Movement

a. Definitions.

(1) *Traffic flow of motor columns*—Traffic flow is the total number of vehicles passing a given point in a given time. Traffic flow is expressed in vehicles per hour. The following formula will help to determine the traffic flow for any route:

Traffic flow in vehicles per hour = density in vehicles per kilometer $\times$ speed in kilometers per hour $\times F$.

F (a variable) depends on the standing operating procedure (SOP) time gaps between march units and serials applicable in the area and on the overall state of proficiency of units operating in the area in motor movement and traffic control. For adaptation to a specific area under field conditions, planners must make continuous time and space studies to arrive at a suitable factor. This study may result in a basic factor to which the planner must add allowance for a time gap between march units and serials, or a basic factor

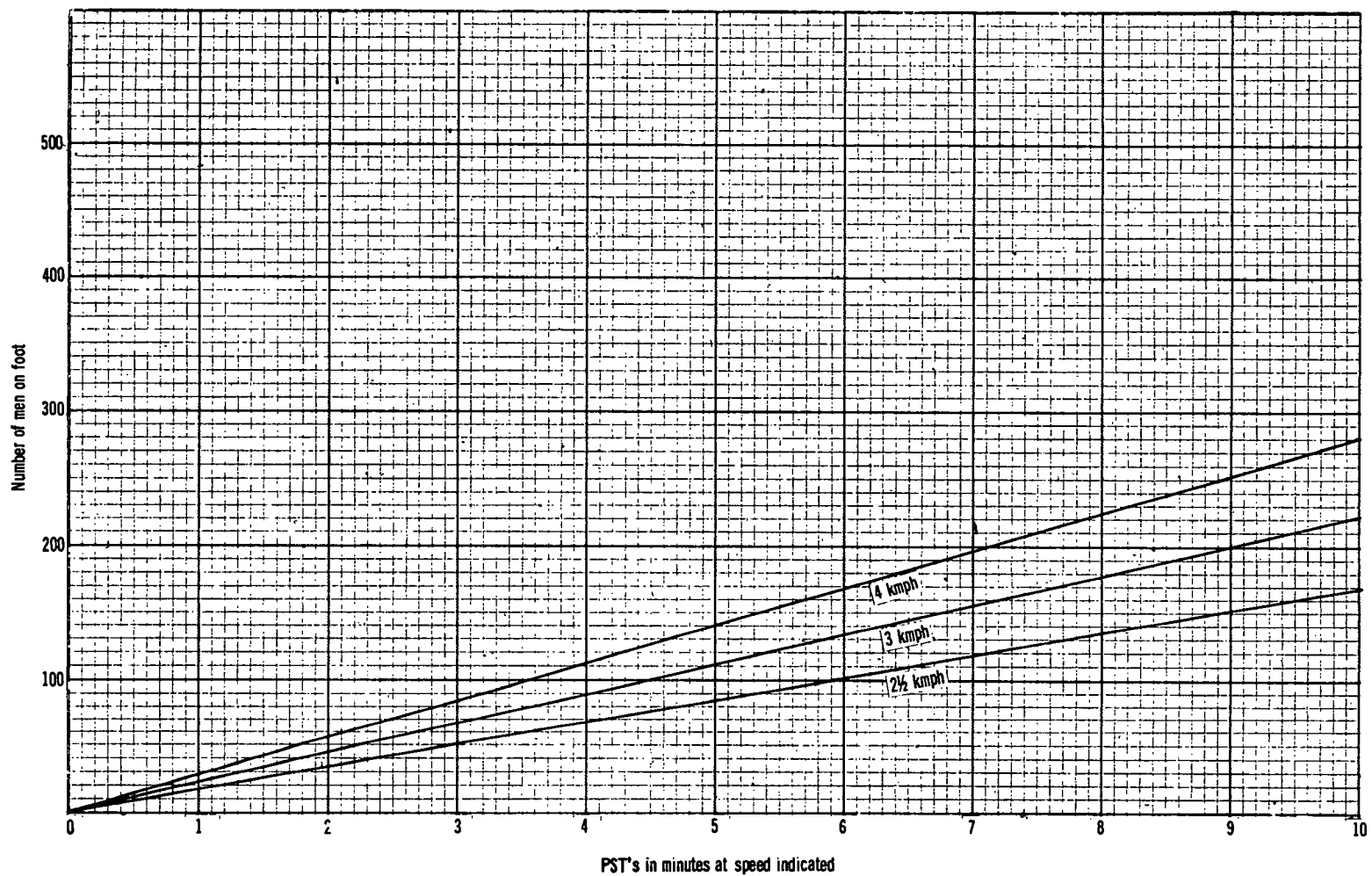


Figure 2-3. PST's of columns on foot—column of two's, 5 meters per man (does not include COLMPG's).

Table 2-4. Rates and Lengths of Road Movements, Foot and Motor Elements

		1		2		3		4		5		6		7	
1	Unit	Rates of march (kmph)						Lengths of march on roads (km per day (avg))	Remarks						
		On roads		Cross country											
		Day	Night	Day	Night	Day	Night								
<i>Inf</i>															
2	Ft trps.....	4	3.....	2 ½	1 ½.....					19-24 for a div; 24-32 for smaller units.	Length of march increased with well-seasoned trps marching on good roads in favorable wea when required by the tac sit.				
<i>Arty</i>															
3	Trkdr, lt or mdm.....	40	40 (lights)..... 16 (no lights).	12	8.....			320.....		Avg rate 8 kmph.					
4	Trkdr, hv.....	29	29 (lights)..... 16 (no lights).	10	6.....			232.....		Avg rate 8 kmph.					
5	Tracdr, hv.....	24	24 (lights).....	10	6 (lights)..... 1 ½ (no lights).			192.....		Avg rate 8 kmph.					
6	ADA, msl.....	32	32 (lights)..... 16 (no lights).	8	3.....			256.....		Avg rate 8 kmph.					
7	ADA, SP.....	32	32 (lights)..... 16 (no lights).	19	8.....			256.....		Avg rate 8 kmph.					
<i>Armor</i>															
8	Tks, lt, and armd carr.....	32	32 (lights)..... 16 (no lights).	24	8.....			256.....		Armd div moves at rate of march of MBT's. Avg rate 8 kmph.					
<i>Armor</i>															
9	Tks, main bat.....	28	24 (lights).....	16	4 ½.....			224.....		Avg rate 8 kmph.					
<i>Misc</i>															
10	Inf div, motorized.....	24	24 (lights)..... 16 (no lights).					192.....		Avg rate 8 kmph.					
11	Trks and ambs not carrying pnts.	40	40 (lights)..... 16 (no lights).					320.....		Single veh or small cols of less than 50 veh. Avg rate 8 kmph.					
12	Ambs carrying pnts.....	24	16 (lights).....	8	8.....			190.....		Avg rate 8 kmph.					
13	Cars, pax.....	55	55 (lights)..... 16 (no lights).					440.....		Avg rate 8 kmph.					

including allowance for a time gap between march units and serials.

(2) *Density of motor columns.*

(a) Traffic density is the average number of vehicles per kilometer or mile of road expressed in vehicles per kilometer or vehicles per mile. Motor columns may be either close column, open column, or infiltration.

1. *Close column.* In close column, vehicles are closed to safe driving distance behind the preceding vehicle. Usually, a fixed speedometer multiplier (SM)¹ is specified (such as 2, 3, 4,

¹For logistic purposes, SM is any number by which speed in kilometers or miles per hour is multiplied to determine the gap between successive vehicles in meters.

Examples: With an SM of 2 the gap between vehicles at a speed of 15 kilometers per hour is $2 \times 15 = 30$ meters; at a speed of 40 kilometers per hour, it is $2 \times 40 = 80$ meters.

etc.) to accomplish a safe driving intervehicular distance at all speeds.

2. *Open column.* In open column, distances between vehicles are increased to accomplish greater dispersion. Usually, a fixed distance (such as 90 or 180 meters between vehicles) is specified, but open column conditions may be obtained by designating a fixed SM high enough to insure the desired intervehicular gap at the lowest speed expected.

3. *Infiltration.* In infiltration, vehicles are dispatched at irregular intervals with a fixed density (such as 3, 4, 5, or 6 vehicles per kilometer).

(b) To determine the density of a motor column, when the speed, SM, and vehicle length (VL) are known, the following formula applies:

$$\text{Density} = \frac{1,000 \text{ (m per km)}}{\text{speed (kmph)} \times \text{SM} + \text{VL}}$$

Example. With a speed of 15 kilometers per hour, an SM of 2, and a VL of 10 meters, vehicle density equals—

$$\frac{1,000}{15 \times 2 + 10} = 25 \text{ vehicles per kilometer}$$

(3) LGTHCOLM.

(a) LGTHCOLM is the length, expressed in units, of a column on the road. LGTHCOLM is the sum of the lengths of the vehicles, the distance between vehicles, and the distance between march elements.

(b) The number of motor vehicles in the column (disregarding trailers and towed weapons), the average density (number of vehicles per kilometer), and the total time gaps between subordinate units determine the LGTHCOLM occupied by a motor column.

$$\text{LGTHCOLM} = \frac{\text{number of motor vehicles}}{\text{density (vehicles per km)}} + \frac{\text{time gaps} \times \text{speed (kmph)}}{60}$$

The following can determine an approximation of LGTHCOLM:

LGTHCOLM (km) = number of vehicles ÷ 75 (less than 25 vehicles in close column).
 = number of vehicles ÷ 30 (25 or more vehicles in close column).
 = number of vehicles ÷ 20 (less than 25 vehicles in open column).
 = number of vehicles ÷ 15 (25 or more vehicles in open column).
 = number of vehicles ÷ 3 (any number of vehicles marching by infiltration).

In close column, a 15-minute time gap occupies 4 kilometers' LGTHCOLM; in open column, a 15-minute time gap occupies 6 kilometers' LGTHCOLM.

(4) *PST*. The PST of a column is the time required for the column to pass a given point. The PST may be determined by the following formula:

$$\text{PST (min)} = \frac{\text{LGTHCOLM (km)} \times 60}{\text{speed (kmph)}}$$

The following can determine an approximation of PST:

PST (min) = number of vehicles × 0.08 (less than 25 vehicles in close column).
 = number of vehicles × 0.18 (25 or more vehicles in close column).
 = number of vehicles × 0.20 (less than 25 vehicles in open column).
 = number of vehicles × 0.30 (25 or more vehicles in open column).
 = number of vehicles × 1.33 (any number of vehicles marching by infiltration).

Add 1 minute per 25 vehicles to the PST of each serial.

(5) *Time distance*. Time distance (TDIS) is the time required for any one individual or

vehicle to travel between two given points. The following formula can determine TDIS:

$$\text{TDIS} = \frac{\text{distance}}{\text{rate of march}}$$

(6) Road and time gap.

(a) Road gap is the distance between march elements. The road gap between march elements is more significant when the column is moving than when the column is halted; therefore, it is generally a factor of time rather than distance ((b) below). The following formula can determine the road gaps:

$$\text{Road gap} = \frac{\text{Time gap (min)} \times \text{rate (kmph)}}{60}$$

(b) Time gap may be the conversion of road gap to time. There are no prescribed standard gaps. These depend on the size of serials and march units, the time available for the movement and the tactics required for protection against air and nuclear attack. All divisions (typical), when moving by motor in a tactical march, may move in up to six march columns—one serial per brigade, one serial for division artillery, one serial for division troops, and one serial for the division support command (DISCOM). These march columns subdivide into battalion serials and march units of company, troop, or battery size. Examples of time gaps between these march elements are as follows:

Between march columns (brigades, division artillery, division troops, and DISCOM) — 15 minutes.

Between serials (battalion) — 5 minutes.

Between march units — 2 minutes. (See FM 61-100.)

b. Vehicle Capacities for Personnel. The capacity of motor vehicles to transport foot troops depends on the rated capacity of the transportation employed, the type of body on the vehicles, the method of carrying personnel, and the distance personnel are to move. Normal capacities for trucks carrying personnel with hand-carried weapons, packs and extra ammunition, with no additional cargo, and excluding driver, are —

	Men
Armored personnel carrier.....	11
Truck, ¼-ton.....	3
Truck, ¾-ton.....	9
Truck, 2 ½-ton.....	20
Semitrailer, 12-ton.....	50

Note. When 2 ½-ton engineer dump trucks carry the loads shown above, some personnel will have to stand; 12-ton semitrailers should haul troops only in emergencies.

The format in table 2-5 can be used to assist in tabulating the approximate number of trucks required to move foot elements with individual equipment.

Table 2-5. Tabulating Truck Requirements

	1	2	3	4	5
1	Unit	Actual Strength	Transported in organic motors	Strengths that require transportation	Number of 2½-ton trucks required
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

2-11. Planning Motor Movements

a. Aids Used in Planning. The detailed work of planning troop movements can be simplified by preparing, in advance, tables, graphs, and other aids based on statistical data and experience factors of the unit. The most important of these aids are —

(1) Tables of simplified formulas for LGTHCOLM's and PST's.

(2) Tables of precalculated LGTHCOLM's and PST's.

(3) LGTHCOLM and PST nomographs.

(4) Unit table of LGTHCOLM's and PST's.

(5) Tables of TDIS's.

(6) Tables of average time factors.

(7) Road movement graphs.

(8) Road movement tables.

(9) Strip map.

(10) Vehicle availability tables.

(11) March calculators.

b. Table of Simplified Formulas for LGTHCOLM's and PST's.

(1) Table 2-6 provides an example of tables of simplified formulas for LGTHCOLM's and PST's. The table allows a time gap of 2 minutes between company march units (2 minutes per 25 vehicles) and builds them into the formulas. It does not include time gaps between serials. A

Table 2-6. Example of Tables of Simplified Formulas for LGTHCOLM's and PST's

	1	2	3	4	5	6	7
1	Column formation	Rate (kmph)	Density (veh per km)	Number of serials	Number of vehicles in serial	LGTHCOLM (km)	PST (min)
2	Close column.....	16	48	One.....	25 or less.....	0.0208V	0.08V
					More than 25..	0.048V	0.18V
3	Open column.....	24	12	Two or more..	25 or less.....	0.0208V +4.0	0.08V/15TG
					More than 25..	0.048V +4.0	0.18V/15TG
4	Infiltration.....	24	2	One.....	25 or less.....	0.08V	0.2V
					More than 25..	0.12V	0.3V
5	Infiltration.....	24	2	Two or more..	25 or less.....	0.08V +6.0	0.2V/15TG
					More than 25..	0.12V +6.0	0.3V/15TG
6	Infiltration.....	24	2	NA.....	Any number...	0.5V	1.25V

Note. V is number of vehicles; TG is number of intervals between serials of brigade size.

planner can easily construct similar tables for other units; he must keep in mind the number of time gaps to be built into a formula.

(2) *Application of simplified formulas.*

(a) Forty-eight vehicles per kilometer is the density employed when marching in *close column* formation; therefore, each vehicle in a continuous march element occupies a LGTHCOLM of 0.0208 kilometer. The company-size march unit (averaging 25 vehicles or less) is assumed to be the continuous march element. This vehicular LGTHCOLM, when multiplied by the total number of vehicles (25 or less) in the column, gives the value for the LGTHCOLM:

LGTHCOLM for one vehicle = 0.0208 or $\frac{V}{48}$ km. The LGTHCOLM for one vehicle can be converted to PST, using the equation $PST = \frac{LGTHCOLM}{\text{rate of march}}$ as follows:

$$PST = \frac{0.0208}{16} \times 60 \text{ (to convert to min)}$$

$$= 0.0788 = 0.08 \text{ minute}$$

The constant 0.08, when multiplied by the total number of vehicles (25 or less) in the column, computes the PST of the column ($PST = 0.08V$ min).

(b) If a *close column* serial consists of more than 25 vehicles, the time gaps between subordinate march units must be considered in the calculations. This is done by converting this time gap, 2 minutes per 25 vehicles, to 0.10 minute per vehicle and adding this value to the constant 0.08 ($PST = 0.18V$ min). This value of PST can be converted to LGTHCOLM as follows:

$$PST = \frac{LGTHCOLM}{\text{rate of march}}$$

$$LGTHCOLM = PST \times \text{rate of march}$$

$$LGTHCOLM = 0.18V \times \frac{16}{60} = 0.048V$$

(c) Twelve vehicles per kilometer is the density employed when marching in *open column* formation; therefore, each vehicle occupies a space of 0.08 kilometer. For a continuous element, then —

LGTHCOLM for one vehicle = 0.08 or $\frac{V}{12}$ km. The LGTHCOLM for one vehicle can be converted to PST as follows:

$$PST = \frac{0.08}{24} \times 60 \text{ (to convert to min)} = 0.2 \text{ minute}$$

The constant 0.2, when multiplied by the total number of vehicles (25 or less), computes the PST of the column ($PST = 0.2V$ min).

(d) If an *open column* serial consists of more than 25 vehicles, the time gap between subordinate march units, 0.10 minute per vehicle, must again be considered. Thus —

$$PST = 0.3V \text{ minute}$$

This value of PST can be converted as in (2) above.

(e) Whenever a column (*open* or *close*) consists of two or more march serials of brigade size, the 15-minute time gap between these serials must be considered in calculations.

Example:

$PST = 0.18V$ min
Rate of march (R) = 16 kmph
Time (T) = 60 min
Time gap (TG) = 15 min
Close column

$$LGTHCOLM = PST \times \frac{R}{T} + \frac{TG \times R}{T} = 0.18V$$

$$\times \frac{16}{60} + \frac{15 \times 16}{60} = (0.048 + 4.0) \text{ km}$$

(f) Two vehicles per kilometer is the density employed when marching by *infiltration*; therefore, each vehicle occupies a LGTHCOLM of 0.50 kilometer. This LGTHCOLM, when multiplied by the total number of vehicles, gives the LGTHCOLM:

$$LGTHCOLM = 0.5V \text{ or } \frac{V}{2} \text{ km}$$

The LGTHCOLM can be converted to PST as follows:

$$PST = \frac{0.5}{24} \times 60 = 1.25 \text{ minutes}$$

c. Table of Precalculated LGTHCOLM's and PST's.

(1) Table 2-7 provides an example of a table of precalculated LGTHCOLM's and PST's, based on simplified formulas ((2) above).

(2) *Illustration of use:*

(a) *Problem.* Determine the PST of two infantry brigades, one with four battalions consisting of 500 vehicles and the other with three battalions of 350 vehicles, moving as one march column in close column formation.

(b) *Solution.* Add the following from b, table 2-7:

PST for 800 (500 + 300) vehicles = 144.00 minutes
PST for 50 vehicles = 9.00 minutes
Time gap = 40 minutes (15.00 minutes between brigades and 5 minutes between battalion-size serials)
PST = 193.00 minutes for 850 vehicles

Note. Time gaps of 2 minutes between company-size march units have been allotted for and built into the values in the table.

d. LGTHCOLM and PST Nomograph.

(1) The nomograph in figure 2-4 shows average LGTHCOLM's and PST's under ideal conditions and does *not* include allowance for time gaps between march units. Actual LGTHCOLM's and PST's may vary somewhat, depending on conditions.

Table 2-7. Example of a Table of Precalculated
LGTHCOLM's and PST's
a. Movement of Less Than 25 Vehicles

Table 1: Relationship between LGTHCOLM and PST for Various Values of N									
1	Number of vehicles in column	2		3		4		5	
		LGTHCOLM (km)				PST (min)			
		Close column 48 veh per km 16 kmph	Open column 12 veh per km 24 kmph	Close column 48 veh per km 16 kmph	Open column 12 veh per km 24 kmph	Close column 48 veh per km 16 kmph	Open column 12 veh per km 24 kmph		
2	1	0.0208	0.08	0.08		0.08		0.2	
3	2	0.0416	0.16	0.16		0.16		0.4	
4	3	0.0624	0.24	0.24		0.24		0.6	
5	4	0.0832	0.32	0.32		0.32		0.8	
6	5	0.1040	0.40	0.40		0.40		1.0	
7	6	0.1248	0.48	0.48		0.48		1.2	
8	7	0.1456	0.56	0.56		0.56		1.4	
9	8	0.1604	0.64	0.64		0.64		1.6	
10	9	0.1872	0.72	0.72		0.72		1.8	
11	10	0.2080	0.80	0.80		0.80		2.0	
12	20	0.4160	1.60	1.60		1.60		4.0	

b. Movement of 25 or More Vehicles

Table 1. Relationship of LGTHCOLM and PST for 1000 ft. of 1					
---	--	--	--	--	--

(2) To determine LGTHCOLM's —

(a) Determine the number of motor vehicles in column, disregarding trailers or towed weapons.

(b) Locate the figure on vertical scale at left of chart, marked "Number of vehicles."

(c) Locate the figure showing average density under which the movement will be made on the vertical scale marked "Density (veh per km)."

(d) Connect these two points with a straightedge. Read the figure at the point of intersection of the straightedge with the vertical scale marked "LGTHCOLM (km)."

(e) This will be the LGTHCOLM, in kilometers, occupied by the column under the given conditions.

(3) To determine PST's —

(a) Obtain LGTHCOLM as directed in (2) above.

(b) Locate the figure representing the speed in kilometers per hour on the vertical scale marked "Speed (kmph)."

(c) Connect these two points with a straightedge.

(d) Read the figure at the intersection of the straightedge with the vertical scale marked "PST (min) (hr)."

(e) This figure is the PST of the column under the condition given.

e. Unit Table of LGTHCOLM's and PST's. This format, provided in table 2-8, is for the infantry division. By use of appropriate TOE's and the basic formulas contained in *b* above, complete tables can be prepared for any unit.

f. Table of TDIS's. Precomputed tables of TDIS's for routine rates of march will simplify calculations. Table 2-9 is an example of such a table, based on 16 kilometers per hour.

g. Average Time Factors — Infantry Division.

(1) These data pertain to G3 time factors considered after an infantry division receives a movement order. They give the times required by the command for —

(a) Making preparation before the leading vehicle can arrive at the start point (SP).

(b) Completing the motor march and making preparations to launch a coordinated attack.

(2) The preparations before the leading vehicle can arrive at the SP include transmission of orders by division; assembling trucks; spotting trucks; map reconnaissance of routes, detrucking areas, and assembly areas; issue of extra ammunition; briefing of troops; and other normal preparations for an anticipated movement. This preparation pertains to the *first* trip, whether the division is completely motorized by the attached transportation and moves in one trip or whether the division moves by organic transportation in two or more trips (echelon). The earliest time in which the leading vehicle can pass the SP after receipt of the order by the division commander is as follows:

(a) If the order is received in daylight for a daylight march (e.g., received at 1000), leading vehicle can cross the SP at 1130 — 1½ hours.

(b) If the order is received at night for a night march (e.g., received at 2200), leading vehicle can cross the SP at 2400 — 2 hours.

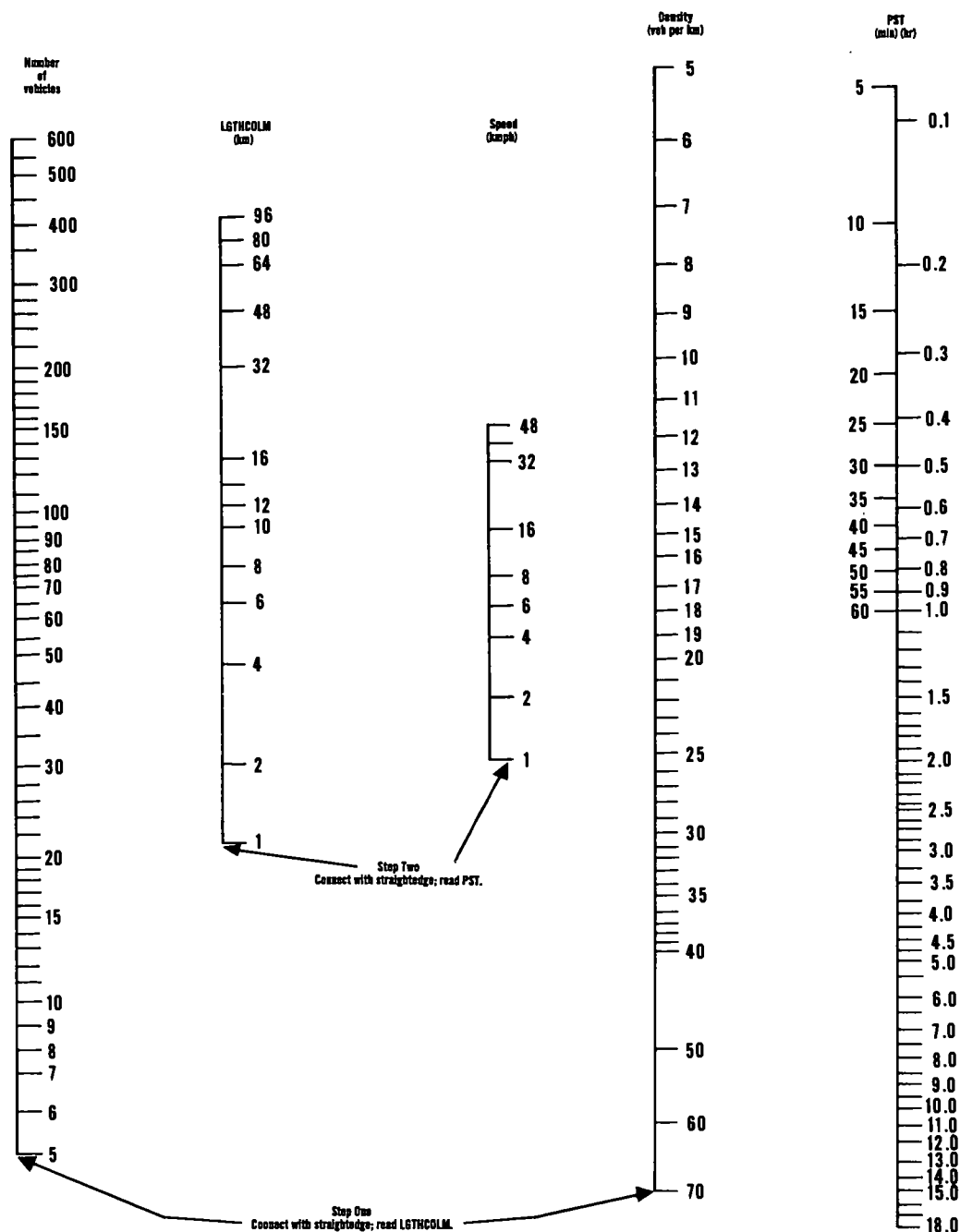


Figure 2-4. LGTHCOLM and PST nomograph.

(c) If the order is received in daylight for a night march (e.g., received at 1100), leading vehicle can cross the SP 1 hour after the beginning of evening nautical twilight (para 2-28c).

(d) If the order is received at night for a daylight march, and more than 2 hours before beginning morning nautical twilight (e.g., received at 0200), leading vehicle can cross the SP at beginning morning nautical twilight. (If the order is received less than 2 hours before begin-

ning morning nautical twilight, the time is the time the order was received plus 2 hours).

Note. To determine corresponding time factors for a foot march rather than a motor march, use $\frac{1}{2}$ hour less in (a), (b), and (c) above.

(3) The factors considered in computing time for an infantry division to complete a march and to make preparations for launching a coordinated attack are dependent on whether the march

Table 2-8. Example of Format for a Unit Table of LGTHCOLM's and PST's¹

Table 2-8. Example of Format for a Unit Table of LGTHCOLM's and PST's.													
1		13	14	15	16	17	18	19	20	21	22	23	
1	Unit	*	PST (min)					Additional veh to carry foot trps (col 9) (2½-ton trk)²	Total veh in march colm when unit moves by trk (col 8 + col 18)	LGTHCOLM (km)		PST (min)	
			Men on foot colm of twos			Veh in march colm (col 8)				Veh of units motorized (col 19)		Veh of units motorized (col 19)	
			2.5 kmph	3 kmph	4 kmph	Close colm 48 veh per km 16 kmph	Open colm 12 veh per km 24 kmph			Close colm 48 veh per km 16 kmph	Open colm 12 veh per km 24 kmph	Close colm 48 veh per km 16 kmph	Open colm 12 veh per km 24 kmph
2	Inf div (1)												
3	HHC												
4	Inf bde (each) (3)												
5	HHC												
6	Inf bn (each) (8)	*											
9	Tk bn (each) (2)	*	*		*		*	*		*		*	
12	Armd cav sqdn	*	*		*		*	*		*		*	
16	Div arty	*	*		*		*	*		*		*	
28	Avn bn	*	*		*		*	*		*		*	
32	Engr bn	*	*		*		*	*		*		*	
36	Sig bn	*	*		*		*	*		*		*	
41	MP co	*	*		*		*	*		*		*	
42	Inf DISCOM	*	*		*		*	*		*		*	

¹Based on TOE _____, dated _____.²Based on 20 men per 2½-ton trk with tlr.

Note 1. Use data in d above as guide in completing form.

2. Colm 2, 3, and 9—based on periodic reports of subordinate units.

3. Colm 6—group that normally precedes main body to a new area for reception of trps.

4. Colm 7—veh not required for immediate spt, e.g., kitchen, baggage, mtr maint, are designated fld tns.

5. Colm 10—number of men on foot (col 9) × 1.2 or 2.7 (para 2-9b(1)) + COLMGP's = meters.

6. Colm 11, 12; 20, 21—number of veh × factor (para 2-10c) + time gaps in km = km.

7. Colm 13—15 $\frac{\text{LGTHCOLM (col 10)} \times 60}{\text{speed (kmph)}} = \text{PST (min)}$.

8. Colm 16, 17; 22, 23—number of veh × factor (para 2-10) + time gaps = PST (min).

9. Colm 18—number of men on foot (col 9) + 20 except to insure tactical integrity.

Table 2-9. Example of a Table of TDIS's

Distance traveled km ↓ km	0	1	2	3	4	5	6	*7	8	9
0	0	4	8	11	15	19	23	26	30	34
10	38	41	45	49	53	56	60	64	68	71
20	75	79	83	86	90	94	98	101	105	109
30	113	116	120	124	128	131	135	139	143	146
40	150	154	158	161	165	169	173	176	180	184
50	188	191	195	199	203	206	210	214	218	221
60	225	229	233	236	240	244	248	251	255	259
70	263	266	270	274	278	281	285	289	293	296
80	300	304	308	311	315	319	323	326	330	334
90	338	341	345	349	353	356	360	364	368	371
100	375	379	383	386	390	394	398	401	405	409
110	413	416	420	424	428	431	435	439	443	446
120	450	454	458	461	465	569	473	476	480	484
130	488	491	495	499	503	506	510	514	518	521
140	525	529	533	536	540	544	548	551	555	559
150	563	566	570	574	578	581	585	589	593	596
*160	600	604	608	611	615	619	623	*626	630	634
170	638	641	645	649	653	656	660	664	668	671
180	675	679	683	686	690	694	698	701	705	709
190	713	716	720	724	728	731	735	739	743	746
200	750	754	758	761	765	769	773	776	780	784

Time in minutes indicated here

* Illustration of use.

PROBLEM. What is the TDIS of a vehicle moving between points A and B, which are 167 kilometers apart, at a rate of 16 kilometers per hour?
 ANSWER: Enter left-hand column at 160, move across to the vertical line under 7, and read the TDIS of 626 minutes directly from the table.

is made by echelon or completed in one trip. The time factors in (a) through (d) below apply only when the march is made by echelon. The time factors in (e) through (i) below apply to any motor move and outline the procedure used in determining the earliest time at which an infantry division can launch a coordinated attack. These factors are based on the assumption that the infantry division can launch a coordinated attack when each of the brigades participating in the coordinated attack is in position behind the line of departure (LD). Since the closing of these brigades requires more time than the preparation and movement of the other forces, supporting units, such as artillery, reserves, etc., will be in position before closing of the brigades on the LD. The factors are further based on the assumption that these assault forces will be the leading elements of the road movement serials.

(a) Dump basic loads: day — 15 minutes; night — 30 minutes.

(b) Load basic loads: day — 30 minutes; night — 60 minutes.

(c) Reassemble trucks for each trip made in convoy: day — 20 minutes; night — 40 minutes.

(d) Entruck personnel: day — 10 minutes; night — 20 minutes.

(e) Complete the motor march from the old area to the new area: see above.

Note. If the release point (RP) is 5 kilometers or less from the detrucking point (DP), TDIS will be the time to complete the move from the SP to the RP. Any consideration of time consumed in moving by motor from the RP to the DP in the new area is included in the time factors given in (g) below. If the distance is more than 5 kilometers from the RP to the DP, the time to traverse this distance must be added to the time required to complete the move from the SP to the RP before considering the time factor for detrucking troops in (f) below.

(f) Detruck, reform foot troops: day — 5 minutes; night — 10 minutes.

(g) Organization and movement in the new assembly area before troops reaching the foot SP's for the foot march to the LD (this includes movement from the RP as outlined in (e) above as well as time to issue any additional rations or ammunition carried in each truck transporting troops): day — 30 minutes; night — 60 minutes.

(h) Time to move from foot SP's in the new area to LD (TDIS of foot march): see paragraph 2-10a(5).

(i) Time for final preparation after the leading man reaches the LD and before launching a coordinated attack: day — 60 minutes; night — 90 minutes. (This factor includes time to close foot troops behind the LD, time to reconnoiter, issue orders in subordinate units, and emplace and register infantry weapons where necessary.)

h. Average Time Factors — Armored Division.

(1) These data pertain to G3 time factors considered after an armored division receives a

movement order. They give the times required by the command for —

(a) Making preparations before the leading vehicle can arrive at the SP.

(b) Completing the motor march and making preparations to launch a coordinated attack.

(2) The preparations before the leading vehicle can arrive at the SP are less time consuming than those in the infantry division because the armored division is able to move the entire division by organic vehicles. Preparations include transmission of orders by division, briefing of troops, and other normal preparations for an anticipated move. As SOP, armored division vehicles refuel and replenish expanded ammunition whenever any element of the division makes a halt or enters an assembly area. Vehicles can then move as soon as personnel and equipment are loaded.

(a) If the order is received in daylight for a daylight march (e.g., received at 1000), the leading vehicle can cross the SP at 1045 — $\frac{3}{4}$ hour.

(b) If the order is received at night for a night march (e.g., received at 2200), the leading vehicle can cross the SP at 2300 — 1 hour.

(c) If the order is received in daylight for a night march (e.g., received at 1100), the leading vehicle can cross the SP 30 minutes after beginning evening nautical twilight.

(d) If the order is received at night for a daylight march, and more than 1 hour before beginning morning nautical twilight (e.g., received at 0200), the leading vehicle can cross the SP at beginning morning nautical twilight. (If the order is received less than 1 hour before beginning morning nautical twilight, the time is the time that the order is received plus 1 hour).

(3) The factors considered in computing time for an armored or an infantry (mechanized) division to complete a march and to make preparations for launching a coordinated attack depend on whether the division is organized for combat. Presumably, the division is organized for combat in anticipation of the move and commitment to battle. The time factors in (a) and (c) below apply to any move and are based on the assumption that the armored division can launch a coordinated attack when two task forces (equivalent of one infantry battalion and one tank battalion) of each brigade are in position to attack. If the division formation is a column of brigades, only the time factors for the leading brigade are computed. If the division formation is brigades abreast, the time factors for the brigade with the greatest distance to traverse are computed as the

factors for the entire division. If the division is not organized for combat, time must be allowed (as included in (a) below) to permit battalions and supporting units to assemble under a brigade and organize into task forces under the brigade commander. Other commands, such as the brigade in reserve, division troops, division artillery, DISCOM, and units placed in division troops, can be assumed to complete their organization in less time than a brigade and, therefore, are not included as a factor. The organization of brigades and task forces may be partially or entirely completed either in bivouac, assembly area, or attack position or a combination thereof. The time factor, however, remains the same.

(a) Organize brigades and task forces (in either one or a combination of bivouac, assembly area, and attack position): day — 45 minutes; night — 90 minutes.

(b) Complete march from old area to new area.

(c) Time for final reconnaissance, refueling, and preparations to cross the LD or leave attack position (may be a combined assembly area and attack position): day — 30 minutes; night — 60 minutes.

i. Road Movement Graph.

(1) A road movement graph is the simplest method of obtaining data required for a road movement table or order. It shows the approximate location at any hour of the head or tail of each serial, provided the road movement proceeds as scheduled. The vertical scale to the left, with point of origin at the bottom, serves as a distance scale in kilometers and should show the relative locations, along the route, of critical points where coordination of the movement is required. The horizontal scale provides a time scale in hours, beginning at the left with the earliest hour at which the first serial may start the march.

(2) A serial is represented graphically by drawing a line to represent the movement of the head of the serial and a line to represent the movement of the tail of the serial. The lines are parallel and are drawn with a slope that represents the rate of march. (At 10 kilometers per hour, the slope equals 10 kilometers on the vertical to 1 hour on the horizontal scale.)

(3) *Example of road movement graph* (fig. 2-5): The 1st Infantry Division commander has directed that elements of the DISCOM and the 3d Brigade move under cover of darkness from their present bivouacs, areas A and B to areas C and D. Foot troops and motor vehicles will move during the night 16-17 October. Movement is to be

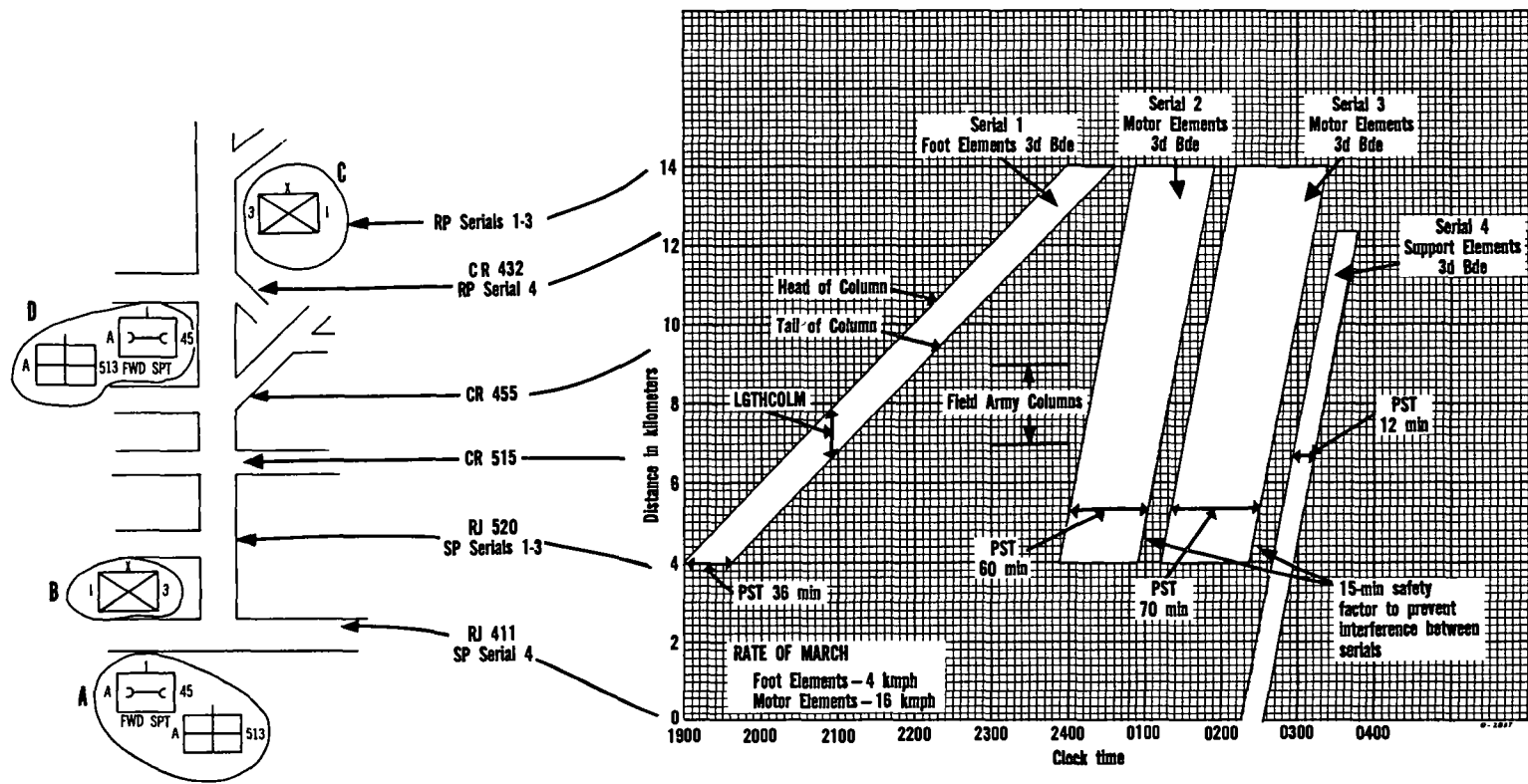


Figure 2-5. Example of a road movement graph.

gin 161900 October and is to be completed 170430 October.

j. Road Movement Table. A road movement table (table 2-10) is an annex to a march or an operation order. The road movement table contains information and instructions concerning the march serials involved in the movement; their serial numbers, rates of march, routes, SP's; times of crossing the SP's, RP's, critical points; times of arrival at or departure from critical points; and other pertinent details. This information usually is obtained from an accurate knowledge of the status of routes and units and from a road movement graph (fig. 2-5). If desired, planners may determine some of the information contained in the road movement table by march calculations. The road movement table usually consists of two parts —

(1) A data paragraph reflecting general information, or information common to two or more serials.

(2) A tabular list of the march serials, together with all other necessary information regarding them.

Road movement tables frequently require a wider distribution than a march or an operation order so that copies can be issued to movement control personnel, MP traffic posts, etc.

k. Strip Map. A strip map (fig. 2-6) is a schematic sketch of the routes of march that contain useful information concerning them. The division or brigades should include a strip map as an annex to the unit march order. It is particularly useful to small-unit commanders for organizational control. Using units should reproduce strip maps in quantity and supply them to key personnel, particularly to vehicle commanders and route markers.

l. Vehicle Availability Table. The vehicle availability table (table 2-11) is useful in planning the movement of an infantry division in its own organic transportation. It helps the transportation officer make a plan for drawing 2½- or 5-ton trucks from subordinate units of the division in accordance with their ability to furnish them. The table lists across its top all the subordinate units of the division except the cavalry squadron.

This unit is omitted because its vehicles normally are not available. In column 1 the 2½- and 5-ton trucks of the division are divided into priorities of availability according to their normal uses. When the transportation officer levies units for trucks, he will deplete each priority, starting with the highest, until he obtains the required number of vehicles. The table does not show all 2½- and 5-ton trucks of the division. The table omits the prime movers, maintenance vehicles, command and fire control vehicles, and essential signal communications vehicles because these vehicles do not haul general cargo or transport troops or other units. For any given move, the number of vehicles actually available will vary because of deadlined trucks, combat losses, and restrictions applicable to the move under consideration. Using the vehicle availability table and the troop strengths of the units requiring additional transportation, the planner can quickly and accurately determine the number and source of vehicles required for the march.

m. Vehicle Assignment Table. The vehicle assignment table (table 2-12) shows from which units planners can withdraw the 2½- or 5-ton trucks (col 1) and to which units they can assign these trucks (col 2-6) for the move. The vehicle availability table (table 2-11) is the basis for this table.

n. March Calculator. A march calculator (fig. 2-7) is a special form of slide rule. The user can read the desired LGTHCOLM or PST of any unit from the calculator if he knows the number of vehicles in the unit column. The calculator readings include the LGTHCOLM's or the time (gaps) between march units but not those between march serials of battalion, task force, or brigade size. When using the calculator to determine the LGTHCOLM's or PST's of two or more brigades, the planner adds to the readings a 15-minute time gap (or equivalent LGTHCOLM) for each gap between march serials of brigade size, plus a 5-minute time gap (or equivalent LGTHCOLM) for each gap between subordinate march serials of battalion or task force size. The time gaps between march units of company, battery, or troop size are built into the readings of the calculator.

Table 2-10. Example of a Road Movement Table
(CLASSIFICATION)

ANNEX B (ROAD MOVEMENT TABLE) to OPOD 9-20th Inf Div

Reference: Map, Series M504 AFGAN, Sheet 4842 (BHAD-WURST), Edition 1-DMG, 1:100,000.

Time Zone Used Throughout the Order: ZULU

General Data:

1. AVERAGE SPEED: 20 kmph.
2. TRAFFIC DENSITY: 20 veh per km.
3. HALTS: SOP.
4. ROUTES

- a. Route RED: Serials: 1, 3, 4, and 5.
- b. Route BLUE: Serials: 2 and 6.

5. CRITICAL POINTS

a. Route RED.

- (1) Start point: RJ 413 at MB201699.
- (2) Release point: RJ 211 at QA990628.

(3) Other critical points.

- (a) RJ (VILLERS) at MB330718.
- (b) RJ 242 at NB455701.
- (c) RJ (LAWST) at DA585692.
- (d) BLUE River bridge at PA683686.

(4) Route classification: 6 × 50.

(5) Route restrictions: BLUE River bridge—
6 × 50.

b. Route BLUE.

- (1) Start point: RJ 526 at MS229509.

- (2) Release point: RJ 105 at RS981511.

(3) Other critical points.

- (a) RJ 592 at MS334481.
- (b) RJ (CHANCE) at NS401490.
- (c) RJ (VEGAS) at QT 790501.
- (d) BLUE River bridge at RS850495.

(4) Route classification: 10 × 50.

(5) Route restrictions: BLUE River bridge—
6 × 50.

6. MAIN ROUTES TO START POINTS: * * *

7. MAIN ROUTES FROM RELEASE POINTS:
* * *

Serial number ⁵	Date ²	Unit	No. of Vehicles	Load Class of Heaviest Vehicle	From ¹	To ¹	Route	Route to Start Point	Critical Points ⁴		Due	Clear	Route from Release Point	Remarks
									Ref.					
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)		(k)	(l)	(m)	(n)
1	* * *	1st Bde. COL Long, Comdr.	* * *	* * *	BHAD area	WURST area	RED	* * *	SP RJ (VILLERS) RJ 242 RJ (LAWST) BLUE River bridge RJ (HAINS) RP		0530 0610 0630 0715 0755 0815 0855	0635 0715 0735 0820 0900 0920 1000	* * * * * *	* * *
	*		*		*			*	*				*	*
5	* * *	Div Trp LTC Camp, Comdr.	* * *	* * *	BHAD area	WURST area	RED	* * *	SP RJ (VILLERS) RJ 242 RJ (LAWST) BLUE River bridge RJ (HAINS) RP		0935 1015 1035 1120 1200 1220 1300	1131 1211 1231 1316 1356 1416 1456		
6	* * *	DISCOM COL Norling, Comdr.	* * *	* * *	BHAD area	WURST area	BLUE	* * *	SP RJ 592 RJ (CHANCE) RJ (VEGAS) BLUE River bridge RP		0944 1002 1044 1214 1254 1334	1200 1218 1300 1430 1510 1550	* * *	* * *

(CLASSIFICATION)

- Notes:—1. Only the minimum number of headings above should be used. Any information which is common to two or more movement numbers or identification serial numbers should be included under the 'data' paragraphs.
2. As the table may be issued to personnel concerned with control of traffic, the security aspect must be remembered. It may not be desirable to include dates or locations.
3. If the table is issued by itself, and not as an annex to a more detailed order, the table must be signed or authenticated in the normal way.
4. 'Critical Point' is defined as 'a selected point along a route used for reference in giving instructions. It includes start points, release points and other points along a route where interference with movement may occur or where timings are critical'.
5. This will be the number which is used to identify a column (or element of column) during the whole of the movement.
6. In the case of an annex having the same distribution as an operation order it will not be necessary to include the headings as shown on this page.

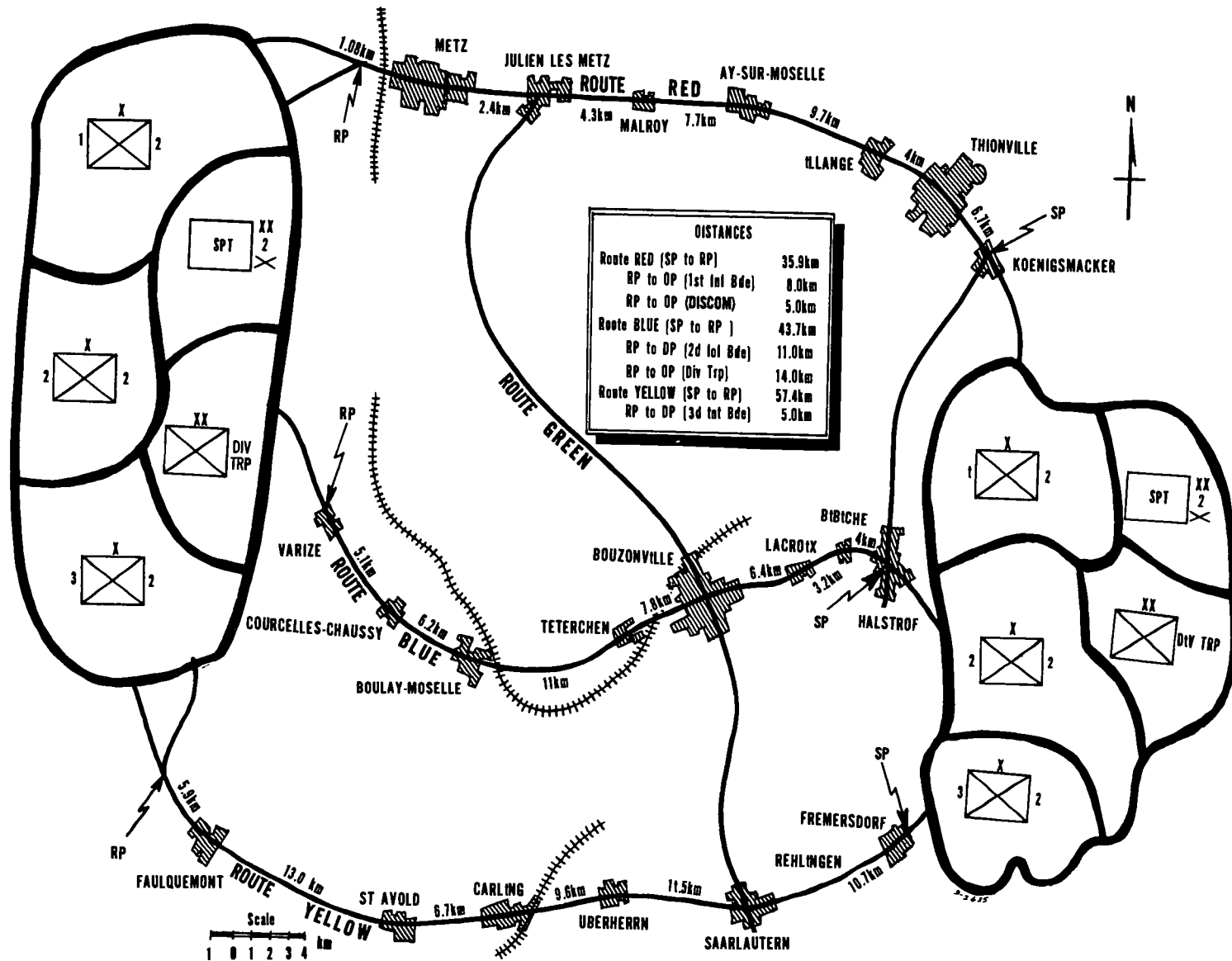


Figure 2-6. Example of a strip map.

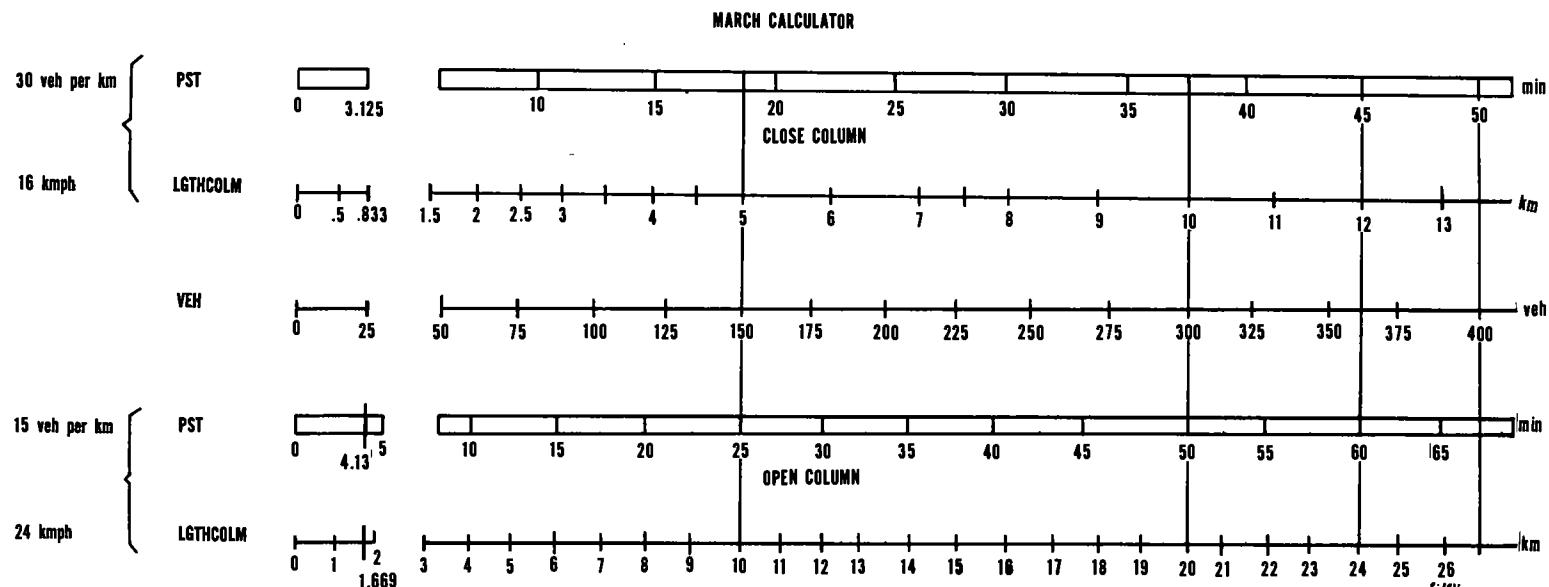
Table 2-11. Example of a Vehicle Availability Table

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Priority	Normal use	1st Bde/ 20th Inf Div	2d Bde/ 20th Inf Div	3d Bde/ 20th Inf Div	HHB/ 20th Inf Div Arty	1-45 Arty	1-46 Arty	1-47 Arty	1-48 Arty	1-49 Arty	1-439 Arty (C/V)	20th Engr	1-2 Armor	HHC/ 20th Inf Div	1-21 Cav	20th Sig*	20th MP Co	20th Inf DISCOM	20th Avn	Total div
		Max/Aval																		
1	Sup and gen cgo...	3/	3/	3/	3/	3/	3/	3/	3/	3/	4/	5/	15/	0/	0/	0/	0/	6/	0/	57/
2	Org equip.....	0/	0/	0/	7/	9/	9/	9/	9/	9/	8/	10/	7/	1/	7/	6/	0/	9/	10/	110/
3	Ki trk.....	7/	7/	7/	1/	3/	3/	3/	3/	3/	3/	6/	6/	1/	1/	1/	1/	3/	1/	60/
4	Engr tool and brg.	4/	4/	4/	0/	0/	0/	0/	0/	0/	0/	57/	0/	0/	0/	0/	0/	0/	0/	69/
5	Ammo trk.....	11/	11/	11/	0/	10/	10/	10/	10/	10/	0/	0/	9/	0/	0/	0/	0/	0/	0/	92/
6	Sig comm.....	0/	0/	0/	3/	0/	0/	0/	0/	0/	0/	1/	0/	0/	0/	0/	0/	0/	0/	4/
	Total.....	25/	25/	25/	14/	25/	25/	25/	25/	25/	15/	79/	37/	2/	8/	7/	1/	18/	11/	392/

*Sig bn veh shown are those without shelters or sig equip installed thereon.
Maximum availability 1/1 Current availability.

Table 2-12. Example of a Vehicle Assignment Table

1	2	3	4	5	6
	1st echelon		2d echelon		
Unit that furnishes transport	1st Bde	2d Bde	3d Bde	Sig bn	Other elements
2 1st Bde.....			22		
3 2d Bde.....			20		
4 3d Bde.....	18				
5 1-1 Armor.....					5
6 1-2 Armor.....				5	
7 1-45 Arty.....					6
8 1-46 Arty.....					7
9 20th S&T.....	10				
10 20th Engr.....		45			
11 20th Sig.....		18			
12 Total.....	28	63	42	5	18



INSTRUCTIONS

1. To find LGTHCOLM and PST of any unit, set edge of slide rule at number of vehicles in that unit and read LGTHCOLM and PST on the appropriate scale above or below.
2. For composite groupings, add vehicles and read as in 1 above.
3. When vehicles in column exceed 400, compute for one-half of total and double the answer.
4. Figures are based on latest TOE's.
5. Readings include LGTHCOLM and time gaps between march units but not between march serials of battalion, task force, or brigade size.
6. When using the calculator to determine LGTHCOLM's or PST's of two or more brigade-size units, add to readings a 15-minute time gap (or equivalent LGTHCOLM) for each gap between these march columns. When brigades are divided into subordinate battalion task force size serials, add a 5-minute time gap (or equivalent LGTHCOLM) for each gap between subordinate serials. The normal 2-minute time gaps between company-, battery-, or troop-size march units are included in the readings shown in the scales of this calculator.

Figure 2-7. Example of a march calculator.

2-12. Motor Movement by Echelon

a. Definition. Motor movement by echelon is a movement in which a unit, such as an infantry division, lacking sufficient organic transportation to move all its personnel and equipment in one trip, uses a portion of its transportation to move its foot troops and essential supplies (by complete tactical units) in successive trips until it has completed the entire movement.

b. Sequence. The sequence of events in terms of time consumed is as follows:

- (1) Preparation time (first echelon).
- (2) TDIS (each route).
- (3) PST (close entire first echelon).
- (4) Unloading.
- (5) Reassembly.
- (6) TDIS (each route).
- (7) PST (returning trucks).
- (8) Loading.
- (9) Reassembly (head of column at SP).
- (10) TDIS (each route).
- (11) PST (close entire second echelon).

c. Basic Principles. Although planners must use vehicles to the maximum in a movement by echelon, they must observe certain basic principles if they are to maintain the combat efficiency of the division. For example —

(1) In levying units for transportation, exclude weapon vehicles; prime movers; maintenance trucks; and essential command, reconnaissance, and signal communication vehicles. Units must retain their battlefield mobility and effectiveness.

(2) Leaving sufficient ammunition vehicles with units moved in the first echelon enables these units to conduct operations until resupply can be effected. Preferably, these units have the use of all their ammunition vehicles. However, they normally can retain at least two-thirds of them.

(3) Normally, provision is made for the field trains to march with their parent organizations. Field trains consist of kitchen, baggage, and administrative vehicles and those vehicles, such as fuel, medical, and maintenance vehicles, that are not part of the combat trains. On arrival in the new area, field train vehicles in the first echelon, assigned for movement of the second echelon, dump their basic loads and return to assist in moving that echelon.

(4) Dumping of the basic loads of a large number of vehicles in the forward area is avoided.

(5) Vehicles taken from a unit operate as a group whenever possible to facilitate control and maintenance by the parent unit.

(6) Vehicles from other elements of a unit move the foot troops of that unit whenever possible. Similarly, vehicles from units usually associated in a normal combat grouping should move the foot troops of that grouping.

(7) Only 2½- or 5-ton trucks, including dump trucks, unless otherwise prescribed, move foot troops.

d. SOP. Because motor movement by echelon requires careful planning, the division should have several plans in the form of SOP's. Time for planning such moves will nearly always be short. In such situations, to modify an existing plan is much quicker than to prepare an entirely new one. SOP plans should contain —

- (1) A plan number.
- (2) A standard composition for the division security force.
- (3) Standard composition and duties of the quartermaster (advance party).
- (4) The units to move in each echelon.
- (5) Organization of columns.

(6) The assignment of vehicles to move foot troops and impedimenta, showing the unit from which obtained and the unit to which assigned for the move.

(7) Adequate provisions for signposting and traffic control.

e. Time Formula. When time precludes detailed planning, such as outlined above, the following formula may be useful in rapidly estimating the total time of such a movement:

$$\text{Hours required} = \frac{\text{number of trips} \times \text{distance in km}}{\text{rate of march in km in the hr}} + T$$

(1) The "number of trips" is the number of trips in either direction; e.g., in a two-echelon movement, three trips would be required — one forward trip to move foot troops, a return trip, and a second trip forward for the remainder of troops and organic loads.

(2) *T* (a variable) represents the number of hours consumed in unloading and loading personnel and equipment, in turnarounds at forward and rear assembly areas, and in closing the column into its destination area. When two routes are available and the movement is in close column in two echelons, a value of 6 may be assumed for *T* as giving a reasonable factor for safety. When more than two routes are available, the value of *T* may be reduced.

(3) "The rate of march in km in the hr" represents the average speed of the vehicles in the movement over a time, including short halts.

2-13. Movement by Air

a. Movement of Army units by Air Force airlift is of two types — administrative and tactical. The Military Airlift Command (MAC) normally provides supporting airlift for intertheater administrative movements. Tactical Air Command (TAC) units normally provide supporting airlift for intratheater tactical movements. However, at times MAC aircraft may augment a tactical airlift operation for personnel or materiel airdrop. Under these conditions a TAC unit usually provides the airlift task force commander.

b. An administrative air movement (chap 6) is simpler than a tactical air movement. Loading for administrative air movement takes maximum advantage of the aircraft's mission-payload capabilities. A tactical air movement is more complex than an administrative air movement. Loading methods for a tactical air movement include parachute assault for personnel and equipment, tactical air landings, and administrative air landings. After the initial parachute assault phase, the tactical plan may call for TAC elements to airdrop supplies and equipment as part of the followup echelon. A tactical air movement may include such aircraft formations as V's in trail, in-trail offset, and columns.

c. The planning differs for tactical and administrative air movements. In planning an administrative air movement, the supported Army unit commander must be prepared to provide the MAC airlift commander with his total movement requirement — the number of troops, the weight and cubage of materiel, a separate listing of out-size equipment, and the quantity and description of hazardous cargo to be carried. In such movements, the roles are reversed. Because his mission is the dominant factor, the ground force commander assumes the major role. At the initial planning conference, the ground force commander must be prepared to provide the TAC airlift commander the concept of operations, including the ground tactical plan; the total force to be airlifted and supported by air; and preliminary aircraft loading tables, which show the airdrop and air-landing requirements. Joint and concurrent planning is essential throughout the operations.

d. The air movement of a large body of troops normally involves concurrent departures from several airfields and concurrent landings at several terminal landing sites in the objective area. The availability of transport aircraft and base facilities, the urgency of the situation, and the likelihood of hostile interference are major factors that determine the number of installations em-

ployed and the number of sorties that the transporting aircraft will make. For staff procedures, air movement tables, and other forms relative to air movements, see FM 100-27 and FM 55-15.

e. Tables 2-13 and 2-14 can be used as planning guides for determining the approximate helicopter or fixed-wing requirements for transporting cargo or personnel in Army aircraft. Information for these tables was extracted from FM 101-20 and TM 55-601. Crewmen should not be counted against payload weight or troop capacity. The recommended weight of payload and fuel is for extended operation at 60° F, no wind, and at sea level. For one-time emergency flights, this figure may be increased to the design limit of the helicopter. The 55-1520-10-series of technical manuals for the respective aircraft give the lift capability at temperatures other than 60° F and at higher elevations.

2-14. Water Movements

a. *General.* Chapter 6 contains capacities of ships and craft, sea distances, steaming rates, turnaround times, and factors for cargo shipping.

b. *Assault Landings Over Beaches.*

(1) *Beach analysis and selection.* Strategic considerations aside, the basis for selection of a beach for an assault landing is the potential of the beach and hinterland to permit the initial landing and the followup logistic support of the forces required for the operations. From a logistic standpoint, the most important considerations are the characteristics of the beach, beach exits, and hinterland and the forecast weather conditions as they influence the ability of the combat service support forces to support and maintain the forces ashore. Increased use of helicopters and amphibious vehicles makes possible the use of less desirable beach areas in the initial assault. Under new concepts of operation and with the employment of nuclear weapons, dispersal of forces and supplies will be necessary; therefore, emphasis will be on the analysis and selection of many small beaches, adequately linked by lines of communications, rather than a few long ones as in the past.

(2) *Considerations in selection.* Planners should make a detailed investigation and thorough study of the hydrography and topography of the landing area, and the long-range forecasts of the weather that may be encountered. Primary considerations in selecting beaches for assault landings are discussed below (fig. 2-8 depicts certain of the features discussed).

(a) *Tides.* The stages of the tide, the tidal range, and the tidal currents affect the passage of underwater obstacles, offshore bars, reefs or

Table 2-13. Army Helicopter Payload Guidance

1	2	3	4	5	6	7	8	9	10
	K30645 OH-6A (Cayuse) obsn	K30746 OH-13S (Sioux) obsn	K30961 OH-23G (Raven) obsn	K31749 UH-1B (Iroquois) utility	K31786 UH-1D (Iroquois) utility	Z33545 UH-1H (Iroquois) utility	K30383/ Z33240 CH-47B,C (Chinook) cargo	K30515 CH-54A (Sky Crane) cargo	K29660 AH-1G (Huey Cobra) attack
1									
Cargo door:									
2 Dimensions-width/height (in).....				48×48	92×49		90×78		
3 Location.....				left & right	left & right		rear		
Cargo compartment:									
4 Height of floor above ground (in).....				27	32		30		
5 Length, usable (in).....				60	92		366		
6 Width, floor (in).....				80.5	96		90		
7 Height, clear of obstructions (in).....				56	52		78	112	
8 Cargo space, optimum (cu ft).....				140	220		1,487		
External cargo:									
9 Max. hook or sling capacity (lb).....				4,000	4,000		16,000	20,760	
10 Rescue hoist capacity (lb).....							600		
11 Cargo loading winch capacity (lb).....							3,000		
Passenger capacity:									
12 No. of troop seats (240 lb per man).....	3	2	2	8	12	14	33		
13 No. of litter and ambulatory.....	2/1	2/2	2/0-1/1	3/1	6/1	6/1	24/3		
Operational characteristics:									
14 Useful load (lb) ¹	1,242	70	2,258	3,900	4,700	4,700	15,800	22,700	8,404
15 Normal cruising speed (knots) ²	110	70	67	90	110	100	110	100	135

¹Useful load: The load-carrying capability of an aircraft. It includes the payload, crew and usable fuel and oil required for the mission. Thus it is evident that a reduction of the fuel load will reduce the endurance and increase the payload. (The payload is the useful load less the crew, full oil, and the required fuel for the mission). Full oil is required for all missions.

²Normal cruising speed: The true airspeed which an aircraft can normally be expected to maintain at some standard power setting below rated military power. This speed will vary with altitude. Airspeeds and fuel consumptions will vary with gross weight, altitude, power settings, and aircraft.

Table 2-14. Army Fixed-Wing Payload Guidance

	1	2	3	4	5	6	7	8	9	10
1		A30071/ A30121 O-1A, E (Bird Dog) obsn	A30171 OV-1A (Mohawk) obsn	A30221 OV-1B (Mohawk) obsn	A30241 OV-1C (Mohawk) obsn	A30621 U-1A (Otter) utility	A30671 U-6A (Beaver) utility	A30721 U-8D (Seminole) utility	A30821 U-8F (Seminole) utility	A30946 U-21A (Shawnee) utility
	Cargo door:									
2	Dimensions-width and height (in) and location	45×33 right	-----	-----	-----	46×45 left 30×42 right	40×40 left & right	35×36.5 right	50.5×26.5 left	45.0×59.0 left
	Cargo compartment:									
3	Height of floor above ground (in)	-----	-----	-----	-----	46	46	-----	48	38
4	Length, usable (in)	-----	-----	-----	-----	156	92	50.5	110.6	240.0
5	Width, floor (in)	-----	-----	-----	-----	60	48	53.6	55.0	46.0
6	Height, clear of obstructions (in)	-----	-----	-----	-----	52	51	46.7	55.0	60.0
7	Cargo space, optimum (cu ft)	-----	-----	-----	-----	293	125	136	168	383.3
	External cargo:									
8	Max hook or sling capacity (lb)	500	4,000	4,000	4,000	-----	1,000	-----	-----	5,000
	Passenger capacity:									
9	No of troop seats (240 lb per man)	1	-----	-----	-----	10	5	5	5	10
10	No of litters and ambulatory	0/1	-----	-----	-----	4/3	2/2	0/5	0/5	3/3
	Operational characteristics:									
11	Useful load (lb) ¹	598 (O-1A) 551 (O-1E)	2,827	2,668	2,672	3,100	2,000	2,300	2,210	2,000
12	Normal cruising speed (knots) ²	87	185	185	185	104	105	155	160	85

¹Useful load: The load-carrying capability of an aircraft. It includes the payload, crew and usable fuel and oil required for the mission. Thus it is evident that a reduction of the fuel load will reduce the endurance and increase the payload. (The payload is the useful load less the crew, full oil, and the required fuel for the mission). Full oil is required for all missions.

²Normal cruising speed: The true airspeed which an aircraft can normally be expected to maintain at some standard power setting below rated military power. This speed will vary with altitude. Airspeeds and fuel consumptions will vary with gross weight, altitude, power settings, and aircraft.

GENERAL BEACH PROFILE DIAGRAM (TIDAL SEA)

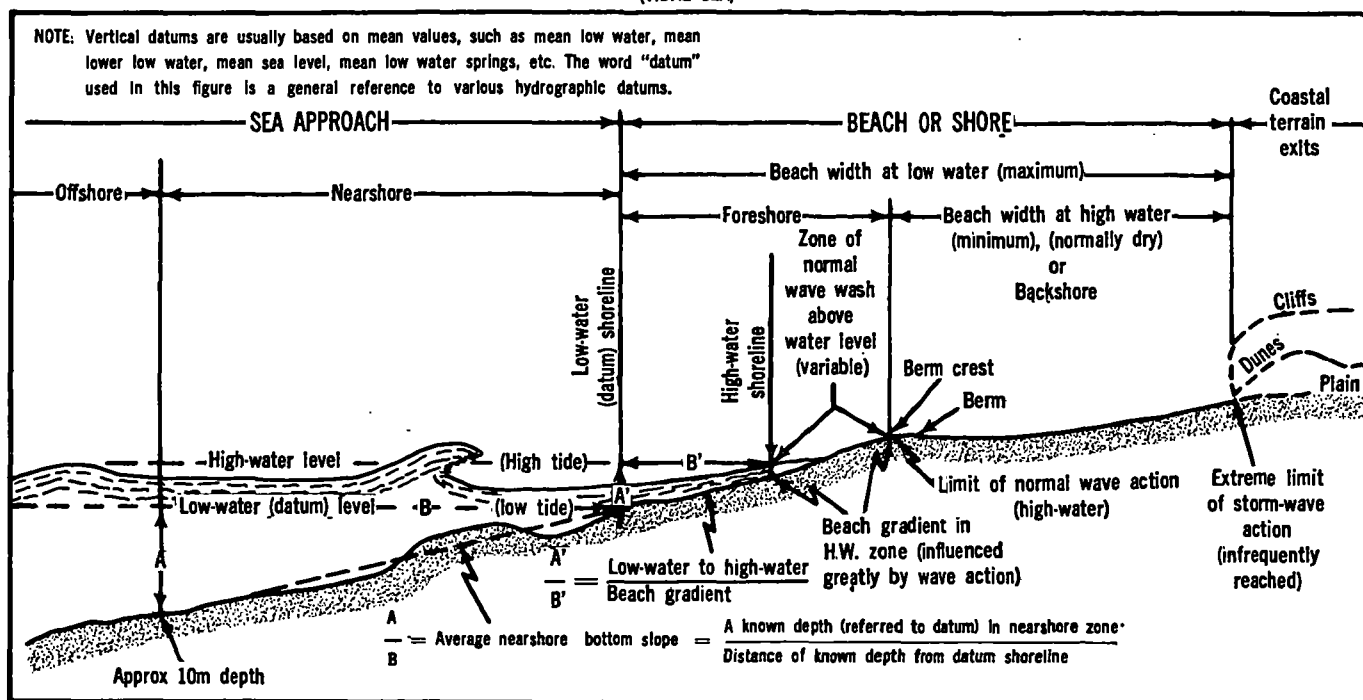


Figure 2-8. General beach profile diagram.

shoals, the beaching or stranding of landing craft, and the width of the beach available for operations.

(b) Surf.

1. Waves breaking onto a beach (surf) may cause landing craft to broach to, thus necessitating a study of surf in connection with landing operations. Surf action depends on wind, tide, and depth of water. On flat nearshore bottoms, waves break and are spent before reaching the shoreline. Over steep slopes, the surf breaks near the shore and consequently has more effect on the beaching of craft. Waves usually break over reefs, where they exist, thus leaving the inner area relatively unaffected. Forecasters can predict surf conditions hours — in some cases days — in advance for almost all shores of ocean areas for which they receive regular weather reports. Waves created by distant storms may break on a shore with a high or heavy surf, even while local weather conditions are otherwise ideal. Surf forecasts should cover the entire operation and should be available for use as long as any operations across the unprotected beaches are necessary.

2. The height of the surf markedly affects the satisfactory operation of amphibious vehicles and landing craft. Lighter amphibious resupply cargo (LARC)-5's experience a 50-

percent reduction in effectiveness when the height of the surf reaches 3 feet; LARC-15's when the height is 4 feet; and LARC-60's when the height reaches 6 feet. Except during emergencies, operation is usually suspended when the surf exceeds 5 feet for LARC-5's, 6 feet for LARC-15's, and 8 feet for LARC-60's. Landing craft, vehicle, personnel (LCVP) are effective when the surf is not more than 3 feet; landing craft, mechanized (LCM) can operate satisfactorily in a surf of not more than 5 feet; and landing vehicles, track, personnel (LVTP)-5 are effective through surf up to 8 feet high.

(c) Nearshore bottom gradient. Gently sloping bottom gradients cause landing craft to ground at a considerable distance from the shoreline, which increases the hazard and time of unloading. Beaches with steep gradients are subject to heavy surf. Because a steep gradient usually extends shoreward from the waterline, planners can anticipate difficulty in moving vehicles and cargo off the beach. A beach gradient of 1 to 20 (1 foot increase in water depth each 20 feet seaward from the waterline) is nearly ideal for the operation of landing craft and amphibious vehicles.

(d) Reefs. In many places, reefs or shoals fringe the shorelines and must be studied before

conducting beaching operations. A minimum 6-foot depth of water should be available over reefs or shoals at low tide to permit the low-water operation of landing craft. This is not the normal situation because most reefs are either very close to the surface or entirely exposed at low tide, in which case certain craft must operate at high tide only. A minimum 11-foot depth of water at low tide is required for the operation of landing ships, tank (LST)'s. When selecting beach sites, planners should avoid reefs or shoals that limit operations.

(e) *Weather.* Planners must consider predicted weather conditions in relation to the projected operation. Adverse weather conditions and their effects on tide and surf may make the operations too hazardous or impossible. Haze or fog conditions may be advantageous or disadvantageous, depending on overall considerations of the operation in question. The weather considerations should cover the entire operation and should insure favorable conditions for not only the assault landings but also the followup and buildup phases.

(f) *Topographic.* Having effected a lodgment ashore, the landing forces will expand the beachhead and initiate general movement inland. Topographic features are of immediate importance. Considerations are the overall length of beach; the extent of access to the interior from the beach (number of corridors and utility of each, the existing road net and means of reaching it from the beach; and areas suitable for supply dumps (both in the beach area and inland), airstrips, airdrops, helicopter landing sites, and cover and concealment. Planners must analyze each of these factors with respect to the advantages or disadvantages that a particular site may offer.

(g) *Equipment.* Planners determine requirements for equipment to unload supplies over the beach. If available equipment will not be adequate, they must try early to procure sufficient amounts of the proper types.

(h) *Enemy action.* Enemy action may be active or passive, or both. Active enemy action includes the use of existing defense installations, established fields of fire, and defending forces. Enemy air and naval capabilities also are considerations. Passive enemy action includes obstacles, demolitions, and mines in water adjacent to the beach, on the beach, and immediately inland. All these will affect the ability of the combat service support troops to furnish the necessary logistic support.

(i) *Troop availability.* Planners must analyze troops available for the operation, to include

extent of training, experience, and general suitability of combat, combat support, and combat service support elements for the operation.

(j) *Time.* After analyzing the factors in (a) through (i) above, planners can decide the time and the place to launch an operation. In addition, visibility (because it affects surprise and operations) in the relative number of hours of darkness, moonlight, and daylight influences the exact time (week, day, and hour) for the assault. The relative effectiveness of the fire and support of the assaulting and defending forces will determine whether the landing takes place in darkness or daylight.

(3) *Beach capacity for assault landing.*

(a) *Size of beaches.* The number of troops that can land simultaneously in assault over a given beach results from a combination of factors. The tactical formation employed by the assault troops should be the dominant factor, provided safety precautions and good judgment are not sacrificed. In general, the length of beach required for landing an infantry brigade varies with its task organization.

(b) *Time and space factors for landing craft and amphibious vehicles.* The interval between landing craft or amphibious vehicles landed simultaneously on a beach varies from 45 to 90 meters. The time interval between waves varies from 1 to 15 minutes.

(c) *Average landing times.* The combat elements of a battalion landing team (BLT) require 2 hours to land over one landing beach employing 17 landing vehicles, tracked, howitzer (LVTH); and 15 LVTP.

(d) *Assault shipping requirements.* When employed in the assault, the reinforced infantry division task organization (considered at 25,000 men, for this example) will typically provide assault BLT's, a division artillery grouping, a division reserve grouping, a division shore party grouping, and a division combat service support grouping. The reinforced armored division may also be an assault division. Assault shipping required for a reinforced infantry division will vary according to the tactical mission and length of voyage. (The number of landing ships varies in proportion to the number of amphibious vehicles; ground combat vehicles; landing craft, utility (LCU); and LCM's to be carried.)

1. For long voyages (e.g., 10 days) planners primarily must consider provision of the type of shipping that will negotiate the distance at a suitable speed and that will best accommodate the embarked troops. Attack transports (APA) and attack cargo ships (AKA) meet these require-

ments better than landing ships. Assault shipping for a reinforced infantry division for an extended voyage, therefore, conforms to the general pattern that table 2-15 depicts.

Table 2-15. Assault Shipping Requirements—Long Voyages

1	2	3	4	5	6
Type of ship	Personnel	Vehicles	Number of ships	Total personnel	Total vehicles
2 APA.....	1,500	50	6	9,200	300
3 AKA.....	200	150	15	3,000	2,250
4 LST.....	190	30	26	4,940	780
5 LSD.....	300	100	7	2,100	700
6 LPH.....	1,500	0	4	6,000	0
7 Total.....				25,040	4,030

2. For short voyages (e.g., 48 to 72 hours) accommodation of embarked troops can be subordinated to provision of the most suitable shipping for ease and efficiency in loading and unloading. Landing ships meet these requirements better than APA's and AKA's, especially when ground combat vehicles and amphibious vehicles are a consideration. Assault shipping for a reinforced infantry division for a short voyage, therefore, conforms to the pattern that table 2-16 depicts.

Table 2-16. Assault Shipping Requirements—Short Voyages

1	2	3	4	5	6
Type of ship	Personnel	Vehicles	Number of ships	Total personnel	Total vehicles
2 APA.....	1,500	50	3	4,500	150
3 AKA.....	200	150	6	1,200	900
4 LST.....	190	30	45	8,550	1,350
5 LSD.....	300	100	16	4,800	1,600
6 LPH.....	1,500	0	4	6,000	0
7 Total.....				25,050	4,000

3. The APA carry large numbers of personnel but few vehicles. A large vehicle requirement or an increased use of landing vehicles, track (LVT) and helicopters in the ship-to-shore movement will generally increase the use of AKA-, LST-, landing ship, dock (LSD)-, and landing platform, helicopter (LPH)-type ships in the amphibious assault, with a resultant decrease in the number of APA-type ships.

4. Available shipping always affects the composition of assault shipping. Efficient loading and allowable overloads likewise affect the number of personnel and vehicles that can be loaded. For example, it was common in both Europe and the Pacific in World War II to load 500 troops on LST's.

(e) *Vehicles and supply.* In loading assault craft, vehicles or supplies may be substituted for men on the basis of space or weight, whichever is the determining factor in each case. The boat space occupied by one man and his individual equipment normally is 240 pounds, 13.5 cubic feet, or 3 square feet.

(4) *Logistics.* The logistic plan for an amphibious operation must complement and implement the scheme of maneuver ashore.

c. River Crossings.

(1) *Bridges.* In an assault on a river line, the number of bridges provided for each tactical unit will vary, depending on such factors as width of river, stream velocity, available road net, trafficability of the soil, types and amounts of equipment available, and number of available engineer troops. As a rule, at least two floating bridges to take division loads will be necessary in the zone of each assault division. Normally, one additional bridge per corps zone and at least one in the field army zone will supplement these bridges. TASCOM troops ordinarily will provide a railroad bridge in the zone of each field army.

(2) *Ferries.* Beside the foregoing factors, the number of bridges planned and the extent of landing craft and amphibious vehicles employed will affect the numbers and types of ferries to use. For narrow streams, the construction of a bridge at each available site is frequently more economical than using ferries. On the other hand, in crossing a wide river when the construction of bridges will be delayed, troops will use ferries of all types to the greatest extent.

(3) *Detailed characteristics of assault boats, bridging, and ferry equipment.* See paragraphs 3-10 and 3-11.

Section III. INTELLIGENCE—MAPPING, AIRPHOTOGRAPHY, AND GEOGRAPHICAL FACTORS

2-15. Intelligence

The military intelligence (MI) organization provides intelligence specialist support to major commanders from division to theater army levels to assist in the production of intelligence. The MI organization includes trained MI, counterintelligence, and field intelligence personnel, along with

necessary administrative and technical personnel. For detailed data concerning organizational concept and intelligence planning, see FM 30-5, FM 30-9A, FM 101-10-3, and TOE 30-25. Special intelligence units and detachments (MI organization) are presented in table 1-3.

2-16. Mapping and Airphotography

a. Mapping and airphotography are intelligence items. Succeeding sections in this chapter provide basic data on responsibilities and factors for estimating various logistic needs in connection with these items. This information is for general planning only. The specific problem of providing map support for an operation should be coordinated with the engineer of the planning echelon.

b. Functions and responsibilities pertaining to mapping and airphotography are given in AR 117-5.

2-17. Types and Scales of Military Maps

a. Types.

(1) *Planimetric map* — A map that presents only the horizontal positions of the features represented.

(2) *Topographic map* — A map that presents the horizontal and vertical positions of the features represented.

(3) *Plastic relief map* — A topographic map printed on plastic and molded into three-dimensional form.

(4) *Photomap* — A single photograph or a mosaic on which gridlines, marginal data, place names, and boundaries are added and which, in some instances, depicts relief graphically.

(5) *Pictomap* — A topographic map in which the photographic imagery of a standard mosaic has been converted into interpretable colors and symbols by means of a pictomap process.

(6) *Plastic relief photomap* — A photomap printed on plastic and molded into three-dimensional form.

(7) *Military city map* — A large-scale topographic map (usually 1:12,500) of a town or city.

(8) *Special maps* — Maps designed for special purpose, e.g., trafficability maps, transportation maps, and boundary maps.

(9) *Terrain model* — A three-dimensional representation of an area, modeled in plaster, sponge rubber, or other materials. It is distinguished from other types of maps in that some cultural and terrain features are shown in realistic model form rather than by topographic symbol.

(10) *Photomosaic* — Assembly of airphotographs to form a composite picture.

b. Scales.

(1) Small-scale military maps are available in scales of 1:40,000,000, 1:10,000,000, 1:5,000,000, and 1:1,000,000. These scales of maps are needed for general planning and for

strategic studies by commanders of large units.

(2) Medium-scale military maps are available in scales of 1:500,000 and 1:250,000. These scales of maps are required for planning operations, including movements and concentrations of troops and supplies. They are used as detailed planning maps, as graphics to illustrate briefings, as bases for medium-scale plastic relief maps, as roadmaps, and for phases of close air-ground support. When no larger scales are available, they are used as tactical maps and to assist field artillery in fire control.

(3) Large-scale military maps are available in 1:50,000 scale. This scale of map is intended to meet the tactical, technical, and administrative needs of field units.

2-18. Requirements for Maps

a. *General.* To calculate quantities of maps required for an operation, the following must be determined:

(1) The number of sheets of each map scale (i.e., the area coverage required at each scale). Data must be obtained from map indexes of the area concerned.

(2) The number of copies of each sheet required for initial issue. Data are in *b* below.

(3) The number of copies of each sheet required for replenishment issues. Data are in *c* below.

(4) The total copies of each scale required. This total equals sheets × initial copies + replenishment.

b. Copies for Initial Issue.

(1) Guides for estimating quantities.

(a) *General.* Small- and medium-scale maps (other than roadmaps) and aeronautical charts are issued in small quantities only to headquarters. Army aircraft also use 1:250,000-scale joint operation graphic-ground-air (JOG-G and JOG-A) maps or both, issued one per aircraft. The basis of issue is the unit headquarters, and quantities vary in proportion to the size of the unit. Basic figures for headquarters map allowances are given in table 2-17.

(b) Large-scale maps.

1. *General.* Bases used in computing allowances of large-scale maps vary with the type of the unit. The company is the basic unit for computing large-scale map requirements. Headquarters and service companies use the same basis as other companies. Allowances for unit headquarters are given in table 2-17. In addition, an allowance of one copy per organic Army aircraft is made.

2. *Infantry and combat engineer units.* Allowances for infantry and combat engineer

units are on the basis of two copies per platoon. The basis of issue for small unit operations is one copy per squad.

3. *Armored and infantry (mechanized) units.* Allowances for armored and infantry (mechanized) units are the same as for infantry units plus an additional allowance of one per tank and carriage and two per armored personnel carrier.

4. *Artillery units.* Allowances for headquarters and service batteries are the same as for infantry units. Allowances for firing batteries are on the basis of one per section plus two per forward observer and liaison officer.

5. *Airmobile airborne units.* Allowances are the same as for equivalent ground troops.

6. *Other units.* Map requirements for other units are on the basis of one per officer and one per reconnaissance noncommissioned officer.

(c) *Roadmaps.* Roadmaps are issued one per vehicle and in limited quantities to unit headquarters.

(d) *Aeronautical charts.* Besides the headquarters allowances, aeronautical charts are issued on a basis of one per organic Army aircraft.

(e) *Photomaps.* Photomaps are issued as substitutes for large-scale maps when the latter are not available. When necessary as supplements to topographic maps, photomaps are issued in quantities not exceeding those authorized for topographic maps.

(f) *Pictomap supplement.* Pictomap supplements have the same basis of issue as photomaps.

(g) *Hydrographic charts.* Hydrographic charts are issued to units and headquarters as required by the situation and the mission of the unit.

(h) *Headquarters.* Besides the guides stated above, table 2-17 indicates the number of copies of each sheet needed by unit headquarters.

(2) *Summary of totals.* Table 2-18 gives the number of copies of each different sheet for initial issue for average operations and includes a small reserve to be held under unit control.

c. *Replenishment Requirements.* The field army requires under its control (besides the initial issue) in field army map depots 100 percent of the initial requirements of maps of all three scales. Replenishment —

Field army 180,000 sheets per day..... 9 tons

d. *Overall Planning Factors.* Initial issue —

Field army 2,700,000 sheets.....135 tons

Corps 420,000 sheets..... 21 tons

(Republic of Vietnam experience indicates values 70 percent higher for initial issue per corps.)

e. *Map Coverage.* Table 2-19 shows map coverage arranged by scale of map.

f. *Typical Planning Procedure.* The field army G2 confers with the G3 to determine the types and scales of maps to be used by subordinate units and field army headquarters. An operational map

Table 2-17. Headquarters Map Allowances

1	2	3	4	5	6	7
Unit	Smallscale maps	Mediumscale maps	Largescale maps	Roadmaps	Aeronautical charts ^a	Plastic relief maps
2 Field army HQ.....	25	75	50	75	50	
3 Corps HQ.....	15	40	75	50	25	One per
4 Div HQ.....	5	25	55	50	10	general
5 Bde HQ.....	1	7	^b 14	15	3	officer.
6 Bn HQ.....	0	3	^b 12	5	0	
7 Co HQ.....	0	1	(^c)	1	0	

^aAdd 1 per organic aircraft.

^bBde and bn needs for service units are 50 percent of those for combat units.

^c50 percent of the needs for combat co in (^b) above, or 1 copy per co, whose needs are based on officer strength.

Table 2-18. Summary of Map Totals

1	2	3	4	5	6
Unit	Smallscale maps ^a	Medium-scale maps ^a	Largescale maps ^a	Road maps	Aeronautical charts ^b
2 Fld army HQ and all fld army nondivisional troops.....	50	600	1,500	4,500	200
3 Corps HQ and all corps nondivisional troops.....	40	600	1,500	3,000	100
4 Inf div.....	25	250	1,190	2,750	150
5 Inf div (mech).....	8	200	1,650	3,650	150
6 Armd div.....	8	200	1,650	3,650	150
7 Abn div.....	8	150	^c 1,000	2,100	140

^aNumber of plastic relief maps not included.

^bProduction and distribution are Air Force responsibilities.

Normally, Air Force distribution to troops is in bulk to CONUS and TASCOT map depots; the engineer makes detailed distribution.

^c1,500 for airborne operations.

Table 2-19. Ground Map Coverage by Scale*

1	2	3	4	5
Scale	Km N-S	Km E-W	Sq km	1 cm = approx (km)
2 1:1,000,000.....	444.5	512.0	228,000	10.1
3 1:250,000.....	112.5	160.9	18,100	2.5
4 1:100,000.....	56.3	40.2	2,265	1.0
5 1:50,000.....	27.3	22.5	615	0.5
6 1:25,000.....	13.7	10.5	142	0.3

*Average figures are given for approximately 40° north latitude. The figures increase toward the Equator and decrease toward the poles.

is selected for use by field army and corps headquarters so that all orders, overlays, and references will be based on the same map. The field army engineer attends these staff conferences to advise on the availability of maps in field army and base map depots, capacity of reproduction facilities, and types and scales that can be most readily reproduced. The G3 outlines the area for which map coverage is desired. This area will be well in advance of the present friendly forward dispositions of the field army because of the time required for procurement, production, reproduction, and distribution of maps. In addition, maps of the future area of operations are required early for planning purposes. The G3 also outlines tentative future dispositions, direction of attack, and boundaries of field army and subordinate units. The engineer uses this tentative information in determining map requirements for the field army. The procedure is as follows:

(1) Lay out the projected field army area for which coverage is desired on the pertinent index map.

(2) In the field army area outlined on the index map, lay out the tentative corps and division boundaries. Project these boundaries to cover the entire area for which map coverage is desired. While these projected boundaries will change during the campaign, divisions and corps of the field army will operate in the area. Therefore, calculations based on one pattern of operations are valid for map procurement purposes.

(3) List the units requiring each map sheet. Divisions in reserve will require map sheets of the entire front in which they may be employed.

(4) List the identifying numbers of the map sheets required to cover the area included within the field army boundaries, including sheets bordering closely on the boundaries.

(5) Determine the number of copies of each sheet required at each echelon, using factors presented herein or developed from experience factors.

(6) List the total number of copies of each map sheet required. These are planning figures for initial issue. Replenishment requirements are

determined by multiplying the number of each sheet required for initial issue by the proper percentage factor given in *c* above. The sum of the initial requirement plus the replenishment requirement for each sheet represents the total number of copies of each sheet that must be procured. These are procured from higher echelon or produced by topographic units in the field army.

2-19. Production of Maps

a. General Production Factors.

(1) Map requirements are estimated well in advance of an operation. Requirements in excess of the production capability of theater topographic units are requisitioned from CONUS.

- (2) Press size.....22½ by 30 (or 29) inches.
- (3) Impressions per
press-day.....25,000 (bulk work only, two
10-hour shifts.)
- (4) Average map paper
consumption per
field army.....5,000 reams per month;
167 reams per day.
- (5) Maximum map paper
consumption per
field army.....500 reams per day.
- (6) Photomap paper
consumption per
field army.....1,000 reams per month.
- (7) Recommended number of colors or press impressions:
Maximum.....8
Standard.....5 (black, brown, blue, green,
and red)
Expedient.....1, 2, 3
Supplements.....1-8

Two- and three-color maps are superior in readability to one color maps and should be adopted when time for standard color reproduction is not available. Characteristics of map paper are given in table 2-20. Map storage is covered in paragraphs 5-27 through 5-36.

b. Production Capacity Required.

(1) *Field Army*. Three million impressions per month (two 10-hour shifts per day).

Table 2-20. Characteristics of Map Paper

1	2	3
Sheet size (in.)	Line map—high wet strength (lb per 1,000 sheets) ^{1 2}	Photomap— coated two sides (lb per 1,000 sheets) ²
2 22½ by 29.....	99	113
3 22 by 29.....	94	108
4 24 by 34.....	121	131
5 26 by 32.....	123	141
6 28 by 50.....	208	236
7 35 by 45.....	231	265
8 Thickness, 1,000 sheets....	4 in.	3.5 in.

¹For U.S. hydrographic charts, use twice the weights shown.

²Weights vary from those indicated ±5 percent.

(2) *Theater army* (one base topographic battalion for each three field armies supported).

(a) Five million impressions per month for each three field armies supported.

(b) A new mapping capacity of 256 square kilometers per day.

2-20. Distribution of Maps

a. *General.* Several factors establish maps as a peculiar supply item that must be handled separately through a system set up exclusively for this purpose. The special factors that place map distribution in a class by itself are as follows:

(1) *Security.* Bulk production, movement, and issuance of maps are accurate indexes of the scope of forthcoming operations.

(2) *Transitory application.* Changes revealed by constantly expanding sources of information may quickly render maps obsolete and require several improved editions or issues in the course of a single operation.

(3) *Relationship to the operation.* Unlike other supply items, maps have a direct relationship to the exact place in which the operation is to occur.

(4) *Phasing of supply.* In general, bulk stocks of maps cannot be prepared nor can distribution be planned far in advance. However, collection of source material for map production must be constant and worldwide. Production must be phased to insure the application of the last bit of terrain information that can be safely used. Issue can be made only after an exact assignment of missions has been made.

b. Responsibility.

(1) The engineer computes map requirements for a command under the staff supervision of the G2. Requisitions are prepared and submitted through engineer channels in time to permit reproduction and shipment of the maps required.

(2) Engineers of corps and larger units distribute military maps in the field, except those maps with a security classification, which may require special handling. The supply and transport battalion of the DISCOM distributes maps in divisions. Maps not printed within an echelon are obtained from the engineer of the next higher unit.

c. Depots.

(1) *Peacetime and CONUS.* Distribution of maps during peacetime and for the CONUS is made by requisitions drawn on the theater or the Army Map Service through channels prescribed by the Chief of Engineers.

(2) *Wartime theater of operations.*

(a) The Army Map Service in the theater of operations establishes map supply depots, which, in turn, establish map supply points. The map supply depots serve both the map supply points and field army map depots. The map supply points serve communications zone units.

(b) Field army map depots receive and store bulk stocks from the map supply depot and, in turn, supply maps to field army units, the field army support command (FASCOM), and corps map depots. One advance map depot is allocated to the field army, with a minimum floor space of 930 square meters.

(c) The corps map depots receive and store bulk stocks from the field army map depot and supply maps to corps units and to DISCOM's.

(d) Operation of the division map store is the responsibility of the DISCOM commander. The only functions performed are to receive bulk stocks, to distribute maps to divisional units, and to store the division reserve map stocks.

d. *Labor Estimates.* Map depot labor may be estimated at 20 man-hours per 10,000 maps issued, including rolling, coding, packing, and collating unit packages.

e. *Normal Map Distribution Flow Chart.* Figure 2-9 portrays the normal flow of map distribution.

2-21. Terrain Models and Plastic Relief Maps

The determination of quantity requirements and the issuance of terrain models and plastic relief maps are matters for staff control. Terrain models and plastic relief maps are seldom stocked outside base plants. The Army Map Service is currently the only base plant for terrain models, and it stocks plastic relief maps at scales of 1:250,000, 1:1,000,000, and certain miscellaneous scales. These maps can be requisitioned through engineer channels. Quantity requirements depend solely on the estimate of the military situation. The necessary provisions to meet these requirements are determined by staff studies of combat needs; the resultant production and supply of models and plastic relief maps are determined by command decision. The commander, having modelmaking units under his control, directs that a G2 intelligence study and an engineer technical appraisal be performed to determine which models are to be constructed. When assigned modelmaking capacities are inadequate, the commander submits appropriate requests to higher headquarters. On completion of construction, the model is issued immediately and directly to the headquarters or command for which it was produced.

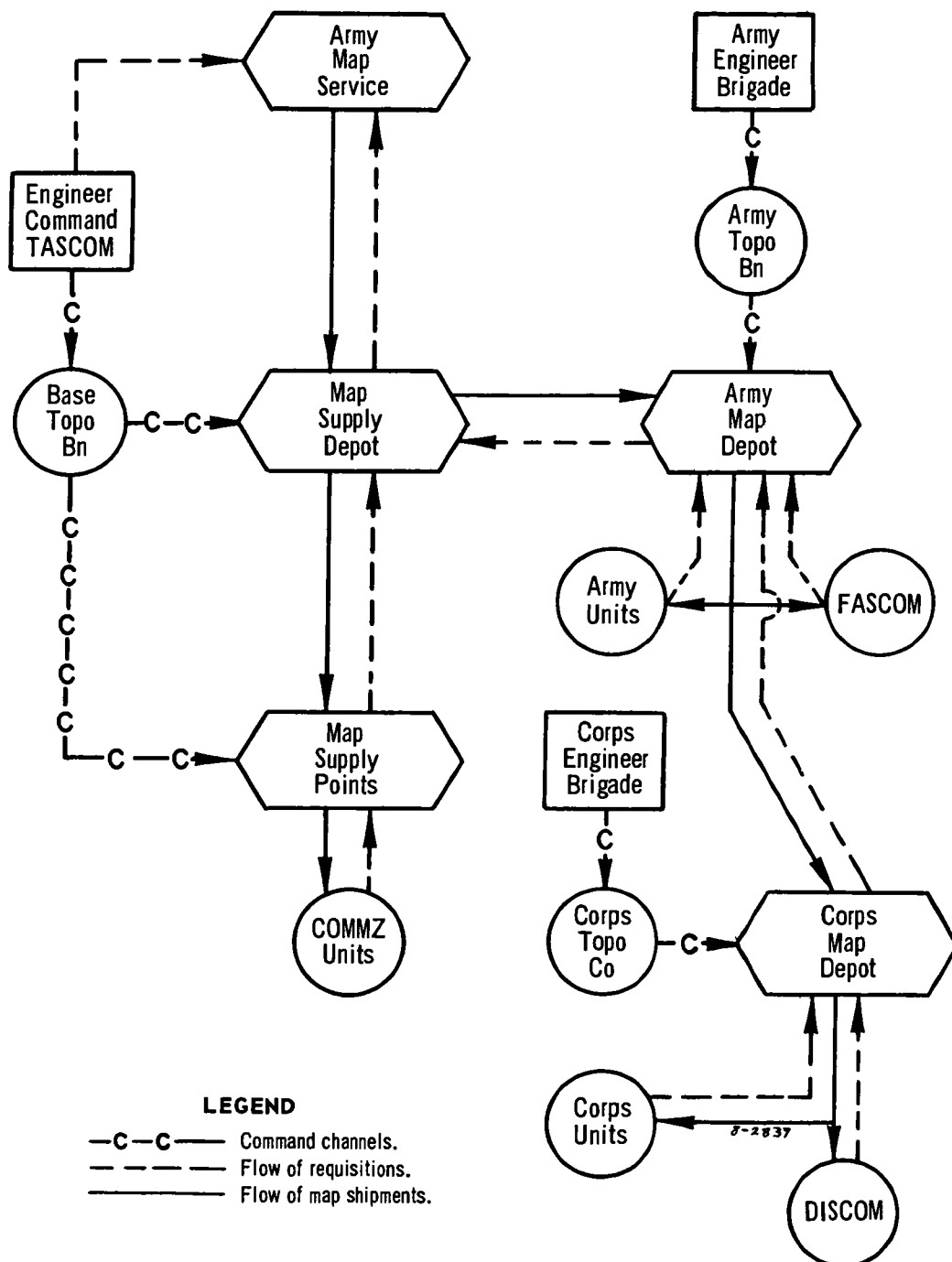


Figure 2-9. Normal map distribution flow chart.

2-22. Gazetteers

a. Gazetteers (place-name indexes) are issued only to higher headquarters. Initial allowances per medium-scale map series are as follows:

Theater headquarters.....	25
Theater army headquarters.....	25
Army group headquarters.....	10
Field army headquarters.....	5
Corps headquarters.....	2
Division headquarters.....	2

b. Production, storage, and distribution of gazetteers are identical with mapping responsibilities: in the CONUS, the Corps of Engineers is responsible; in a theater of operations, the theater army engineer is responsible.

2-23. Trig Lists

a. *General.* A trig list is a list published by certain Army units which includes essential information of accurately located survey points. The respective elevations, descriptions, and other pertinent information for those ground control points appear within the limits of a map or maps of a certain series to which they are keyed. The horizontal positions are generally arranged by increasing northings on the map sheet so that the user can locate quickly any point of a given map sheet of a series. The vertical stations (bench marks) along the lines of spirit leveling usually are arranged consecutively along the route of the leveling survey.

b. *Bulk Stocks of Trig Lists.* Trig lists normally are provided in bulk at echelons from army group to divisions.

c. *Number of Trig Lists at Each Map Scale.* The scale of the map sheet to which each trig list is keyed and the number of map sheets covered by a particular trig list vary from country to country because of density and distribution of the geodetic control. Therefore, it is necessary to determine the number of map sheets covering the specific area and to relate this information to the *Trig List Catalog*, from which the scale and number of map sheets covered per trig list can be determined. A trig list key number appears in the *Trig List Catalog* and on the cover of each trig list. For identification and logistic reference, the trig list key number is used.

(1) *Field army area coverage.* The number of different trig lists required per field army can be determined on the same basis as for maps.

(2) *Division and smaller unit area coverage.* The number of trig lists required to cover an average area of operations can be determined on the same basis as for maps.

d. *Guides for Estimating Quantities of Trig Lists Required for Initial Issue.*

(1) Trig lists should be distributed to only those units having a requirement for geodetic data (i.e., staff engineers, engineer topographic units, artillery units, missile units).

(2) Besides the guides stated in (1) above, the following quantities are needed by units indicated.

Note. In most foreign countries, trig lists are CONFIDENTIAL.

Unit	Number of trig lists
(a) Army group:	
Army group engineer.....	1
Survey liaison detachment.....	1
(b) Field army:	
Field army engineer.....	1
Engineer bn (army) (topo).....	2
(c) Corps:	
Corps engineer.....	1
Engineer co (corps) (topo).....	2
Corps artillery.....	10
Weapons bn.....	1
(d) Infantry division:	
Division artillery.....	13
HHB.....	3
FA bn, 105-mm (towed).....	6
FA bn, 155-mm (towed)/8-in (SP).....	3
FA bn, HJ.....	1
Division engineer.....	1
(e) Infantry division (mechanized):	
Division artillery.....	14
HHB.....	3
FA bn, 155-mm (SP).....	6 (2 per bn)
FA bn, 155-mm/8-in (SP).....	3
FA bn, HJ.....	2
Division engineer.....	1
(f) Armored division:	
Division artillery.....	14
HHB.....	3
FA bn, 155-mm (SP).....	6 (2 per bn)
FA bn, 155-mm/8-in (SP).....	3
FA bn, JH.....	2
Division engineer.....	1
(g) Airborne division:	
Division artillery.....	8
HHB.....	2
FA bn, 105-mm (towed).....	6 (2 per bn)
Division engineer.....	1
(h) Airmobile division:	
Division artillery.....	10
HHB.....	2
Avn btry.....	1
FA bn, 105-mm (towed).....	6
FA bn, 105-mm (towed) (abn).....	1 (2 per bn)
FA bn, aerial artillery.....	1
Division engineer.....	1

(i) U.S. Army missile command. Quantities are determined by the mission.

e. Production of Trig Lists.

(1) *Responsibilities.* Compilation and printing of trig lists normally are accomplished by the Army Map Service (CONUS) and all military topographic units (theater of operations) having the geodetic data and survey results necessary to

compile field sketches for each station, to prepare bilingual descriptions, and to compute necessary coordinate systems required for the area. Trig lists produced in the CONUS are considered adequate reproduction material and can be reproduced in the theater of operations by military topographic units.

(2) *Format*. Trig lists normally are bound publications of 1/4- to 1/2-inch thickness, with a trim size of 9 by 11 inches, and are printed on map stock, high wet-strength paper. However, this format may vary in the field.

2-24. Types and Categories— Airphotographic Imagery

a. *Types of Permanent Record Imagery*. Permanent record imagery can be obtained through the use of conventional photographic cameras, infrared (IR) sensor devices, and radar.

(1) *Classification of conventional photography*. Conventional photography is classified by the camera position and the area of coverage.

(a) Classification by camera position is as follows:

1. *Vertical* — Coverage of a target with photography taken from directly overhead. It provides photography of relatively constant scale and allows the interpreter to get the best stereovision and most accurate measurements.

2. *Oblique* — Coverage of a target area with the photography taken at an angle from the vertical. Oblique photography presents a view of the target area similar to the view that the pilot has while he flies toward or parallel to the area. Oblique photography closely resembles the normal eye view and allows an interpreter to “see” into an area in a normal fashion rather than to see the target as it appears from directly overhead. High-oblique photography includes a portion of the skyline behind the target area; low-oblique photography does not. Oblique photography taken with an 80-percent overlap between frames allows stereoviewing.

3. *Panoramic* — Coverage by a special camera that scans across a wide area of the terrain, usually from horizon to horizon. Panoramic photography provides rapid coverage of large areas of terrain on both sides of an aircraft's line of flight in only one pass over the target area.

(b) Classification by area of coverage is as follows:

1. *Pinpoint* — Coverage of a single point, feature, individual target, or small area of terrain by a small number of photographs. A minimum of 60-percent overlap between individual photoframes is necessary to insure stereoviewing.

2. *Strip* — A continuous series of overlapping photographs taken in a single flight line that covers a lengthy target or a large area of terrain.

3. *Continuous strip* — A single strip of photography that contains an unbroken image throughout the length of the flight line. This type of photography requires a special camera and eliminates the need for individual photoframes with overlap throughout the length of the strip.

4. *Area* — Two or more strips of photography that overlap to the side. A minimum of 30-percent sidelap between strips, besides the 60-percent overlap between frames, is necessary to provide stereoviewing throughout the area of coverage. The main use of area photography is in planning or for comparing coverage by inspection with other imagery available. Area photography with the proper overlap and sidelap can be used to make photomosaics. Normally, area photography is vertical photography.

5. *Mapping* — Mapping or charting photography taken for the purpose of preparing or revising maps and charts. Usually, it is taken at much smaller scales than intelligence photography and should be used for intelligence purposes only when no other intelligence photography is available. This photography is taken with special stabilized cameras and other equipment, and the flight pattern and evaluation of the aircraft are carefully controlled.

(2) *IR imagery*. An IR system is a passive sensor that detects emitted and reflected thermal radiation coming from the terrain and objects on the terrain. Current IR systems filter out reflected radiation and record only the radiation emitted by the object. The total emitted radiation is a function of an object's temperature and its emissivity. Emitted radiation differs between objects, and the resultant differences are sensed and recorded by the IR system. The IR sensor can detect minute differences and thus differentiate objects close to one another. To achieve the maximum capability, the IR system must operate at low altitude, and its scan coverage is limited to the area directly below the flightpath of the aircraft. Therefore, it normally is used only for point, linear, or small area targets.

(3) *Side-looking airborne radar*. Side-looking airborne radar (SLAR) is an active electronic device that emits energy and senses that portion of the emitted energy that is returned by reflection off the terrain and objects thereon. The radar's energy may be directed at the terrain to the left, right, or both sides simultaneously along the flightpath of the aircraft. The energy reflect-

ed from both fixed and moving objects on the ground is recorded on strips of film. Since the radar pulse is line of sight, any high ground or tall objects in the path of the radar pulse block out radar returns from any smaller objects that they mask. This causes SLAR returns to leave blank spots, called radar shadow, wherever these hidden areas occur.

b. Categories of Permanent Record Imagery. The three categories of permanent record imagery commonly used by the imagery interpreter are initial record, general intelligence record, and detailed intelligence record. The availability of improved imagery interpretation equipment in the tactical imagery interpretation facility (TIIF) allows the usable scales of photography to be increased in each category as indicated in (1) through (3) below.

(1) *Initial record.* Initial record is complete, permanent imagery coverage—usually flown seasonally—of a projected or actual area of operations generally extending from the line of contact with enemy ground forces to deep within enemy territory. Photographic coverage normally is of small scale (1:20,000 to 1:60,000) and suitable for stereoscopic study. Initial record provides basic information about enemy installations and defenses, cultural features, trafficability, soil, and vegetation. Its principal purpose is to provide a basis for evaluating changes in enemy-held territory. Areas subjects to seasonal changes are recorded under conditions characteristic of each season to eliminate the observed differences caused by seasonal variations. Vertical initial record may serve as a map substitute or supplement. The field army normally supervises the automatic initial distribution to subordinate units according to areas of interest and makes supplementary issues as necessary.

(2) *General intelligence record.* General intelligence record is vertical medium-scale (1:10,000 to 1:20,000) imagery coverage in the field army area of interest. It provides current intelligence information and is compared with initial record imagery to determine current location and disposition of enemy installations, troop concentrations, troop movements, equipment, and supplies. Normally, this type of imagery is requested by division and higher headquarters.

(3) *Detailed intelligence record.* Detailed intelligence record supplements the general intelligence record by providing large-scale imagery of areas of specific interest. It provides the imagery for detailed analysis of specific enemy activity, selected terrain features, installations, or equipment. It is frequently necessary to use more than

one sensing or recording system over the target. Types of detailed analysis are shown in (a) through (d) below.

(a) *Vertical.* The study of large-scale (1:10,000 and larger) photography reveals the plans and heights of installations not shown in the general intelligence record.

(b) *Oblique.* The study of airphotographs taken at an angle from the vertical reveals installations from the elevation standpoint. This type of imagery is particularly important in the analysis of features not suitable for vertical analysis, such as concealed or well-camouflaged installations.

(c) *Concealment.* Installations and equipment hidden from observation may be detected and subjected to study by special recording techniques; for example, a camouflage net located through general intelligence record imagery may be identified as a covering for mechanical equipment when the area is subjected to IR search.

(d) *Deception.* Enemy measures designed to deceive and confuse friendly intelligence collection agencies may be detected through analysis and comparison of photographic and electronic presentations (e.g., radar, IR, and electronic intelligence) collected at or near the same time.

2-25. Requirements for Airphotography

a. An initial issue of basic cover is made to field army units according to their requirements. Supplemental issues are made as required during the progress of the campaign. Typical initial issue of basic cover is shown in table 2-21.

b. Detailed planning data for determining the number of airphotographs required to cover a given area are contained in TM 30-245. For general planning purposes, the minimum number of photographs required for stereoscopic coverage of an area at a desired scale can be determined by dividing the square meters of the area by the net gain per photograph. The minimum number of photographs should be increased by 20 percent to allow for overedge coverage. The net gain planning factors are as follows:

(1) For 9- by 18-inch photograph —

Net gain = $1/40 S^2$ (S = denominator of scale of desired photograph).

(2) For 9- by 9-inch photography —

Net gain = $1/80 S^2$.

Example:

Given: An area 8,000 meters by 12,000 meters to be photographed at a scale of 1:5,000.

Find: The number of 9- by 18-inch photograph required.

Solution: $\frac{8,000 \times 12,000 \times 40}{5,000^2} = 154$ photographs minimum.

$154 + 20 \text{ percent} = 184$ photographs minimum.

Table 2-21. Typical Initial Issue of Basic Cover---Airphotographs

1	Unit or agency	2 Number of sets	3 Depth into enemy territory (km)	4 Number of 9- by 9-inch photographs		5 Total (approx lb)	
				1:25,000	1:10,000	1:25,000	1:10,000
2	Theater army, base topo bn.....	2 sets theater army area.....	480	40,000.....	248,000.....	1,332.....	8,266.
3	Fld army G2 (MI bn, air recon spt, fld army).	(Based on 160-km width) 2 sets fld army zone sector.	480	20,000.....	124,000.....	666.....	4,133.
4	Fld army topo bn.....	(Based on 160-km width) 1 set fld army zone sector.	480	10,000.....	62,000.....	333.....	2,066.
5	Fld army G2 (imagery intrpr sec).....	(Based on 160-km width) 1 set fld army zone sector.	480	10,000.....	62,000.....	333.....	2,066.
6	Corps G2 (imagery intrpr sec).....	(Based on 55-km width) 1 set corps zone/sector.	160	1,200 each corps.	7,175 each corps.	40 each corps.	240 each corps.
7	Corps topo co.....	(Based on 55-km width) 1 set corps zone/sector.	160	1,200 each corps.	7,175 each corps.	40 each corps.	240 each corps.
8	Corps arty (imagery intrpr sec).....	(Based on 55-km width) 1 set corps zone/sector.	160	1,200 each corps arty.	7,175 each corps arty.	40 each corps arty.	240 each corps arty.
9	Div G2 (imagery intrpr sec).....	(Based on 15-km width) 2 sets division zone/sector.	80	400 each div.	2,110 each div.	17 each div.	140 each div.
10	Div arty (imagery intrpr sec)*.....	(Based on 15-km width) 1 set division zone/sector.	80	200 each div arty.	1,055 each div arty.	7 each div arty.	70 each div arty.

*Attached to div from MI bn, fld army.

Table 2-22. Total Airphotographic Requirements for a Field Army

1	Area	Coverage (scale 1:10,000)			
		Basic ¹		Tactical ² (depth 25 km)	
		Photographs	Wt/lb	Photographs	Wt/lb
2	Field army zone/sector (based on 160-km width).	Depth 21,600	160 km 728	1,600	96
3	Corps zone/sector (based on 60-km width).	Depth 3,640	80 km 255	480	34
4	Division zone/sector (based on 15-km width).	Depth 1,560	40 km 108	160	11

Table 2-23. *Reproduction Section, MI Battalion, Air Reconnaissance Support, Field Army (TOE 30-7G)*

1	2	3
Remarks	Format sizes	Capabilities
2 Section reproduces and identifies air imagery obtained from tactical air force reconnaissance elements.	4 1/2 by 4 1/2, 4 1/2 by 10 2/3, 9- by 9-, and 9- by 18-inch photographic imagery.	Reproduction of duplicate positive, duplicate negative, and photographic prints of air imagery either by selected frame or continuous strips of all format sizes. Enlargement capability of 2 to 1 of 4 1/2 by 4 1/2-inch imagery. Packaging and identification of reproduced imagery for delivery.

Table 2-24. *Imagery Interpretation Section, MI Battalion, Air Reconnaissance Support, Field Army (TOE 30-7G)*

1	2
Remarks	Capabilities
2 Prepares imagery interpretation reports, mosaics, and other interpretation of air imagery for the field army as required.	Plots and performs immediate interpretation of air IR, radar, and photographic imagery. Prepares and disseminates imagery interpretation reports on this imagery. Provides liaison with reconnaissance elements of the tactical air force that provides support to the field army; briefs and debriefs Air Force pilots to secure information obtained from visual sightings.

Table 2-25. *Air Force Photographic Units*

1	2	3
Unit	Photographs furnished	Remarks
2 Reconnaissance wing (theater of operations).	Specialized photography needed by topographic units for photogrammetry and photography for strategic purposes beyond the scope of reconnaissance wings of tactical air commands and tactical air forces.	Wing may include mapping and charting squadrons. Mapping photography ordinarily not suitable for intelligence purposes because of small scale and lack of detail. May contain important information, however, and prints should be made available to MI officers for study.
3 Reconnaissance wings of tactical air commands and tactical air forces.	Photographs needed for intelligence or combat purposes (single photographs, vertical and oblique; stereopairs; or night photographs).	Also visual reconnaissance missions are capable of providing limited vertical and oblique photographs. Photographic missions capable of large quantities of high-altitude vertical and oblique photographs and, under extremely urgent circumstances, limited and low-altitude vertical and oblique photographs.

c. Table 2-22 may be used for initial rough estimates of airphotographic requirements.

2-26. Airphotographic Reproduction and Imagery Interpretation

Functions of two sections of the MI battalion, air reconnaissance support, field army (TOE 30-5G), are illustrated in tables 2-23 and 2-24. Data on the functions of two Air Force photographic units are contained in table 2-25.

2-27. Expressing Time and Dates

a. *Time.* Time is expressed in a group of four digits, ranging from 0000 to 2400. The first two digits are the hours after midnight, and the remaining two digits indicate the minutes past the hour. When the hour can be expressed by a single digit, it is preceded by zero; for example, 0625 for 6:25 a.m. Correct official time is available at the nearest signal center.

b. *Dates.*

(1) The day, month, and year are expressed in that order, except when it is necessary to speci-

fy a six-digit time group and then the following order is used: the first two digits indicate the day of the month, the next two digits indicate the hour, and the last two digits indicate minutes past the hour.

Example: 070625 Dec 67 (6:25 a.m. 7 Dec 67). The day is expressed by numerals; the month is either spelled out or abbreviated. Abbreviations, if used, consist of the first three letters of the word. The year is expressed by four digits or by the last two digits.

Example: 14 January 1968; 14 Jan 68.

(2) When it is desired to keep dates secret, or to depict an undetermined date, the date may be expressed by the letter D plus (+) or minus (-) a numeral, e.g., "Assault elements depart for marshaling area on D-2."

c. *Greenwich Civil Time.* Communications between headquarters in different time zones usually are dated, and references to dates and times usually are made in Greenwich civil time. The standard time at Greenwich, England, is accepted as the basis for measuring time throughout the

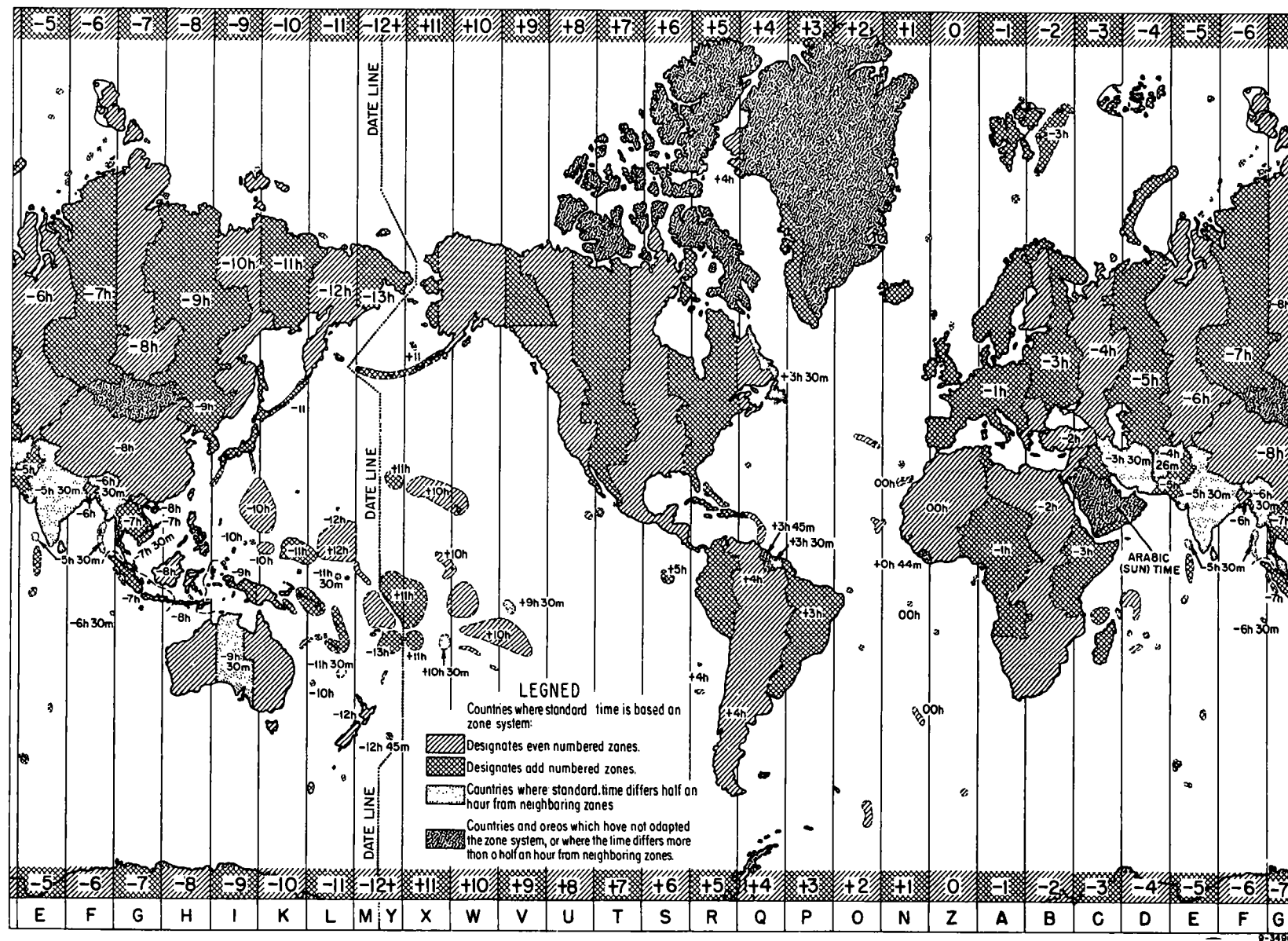


Figure 2-10. Time zone chart.

world. Local civil time can be changed to Greenwich civil time by adding or subtracting the appropriate number of hours as indicated in the time zone chart in figure 2-10. Greenwich civil time can be changed to local civil time by reversing the signs of the time zone chart. Appropriate adjustments must be made for daylight saving time.

d. *Time Suffixes.* Time groups expressing Greenwich civil time are designated by the letter suffix Z immediately following the last digit of the group. For example, 190225Z indicates 2:25

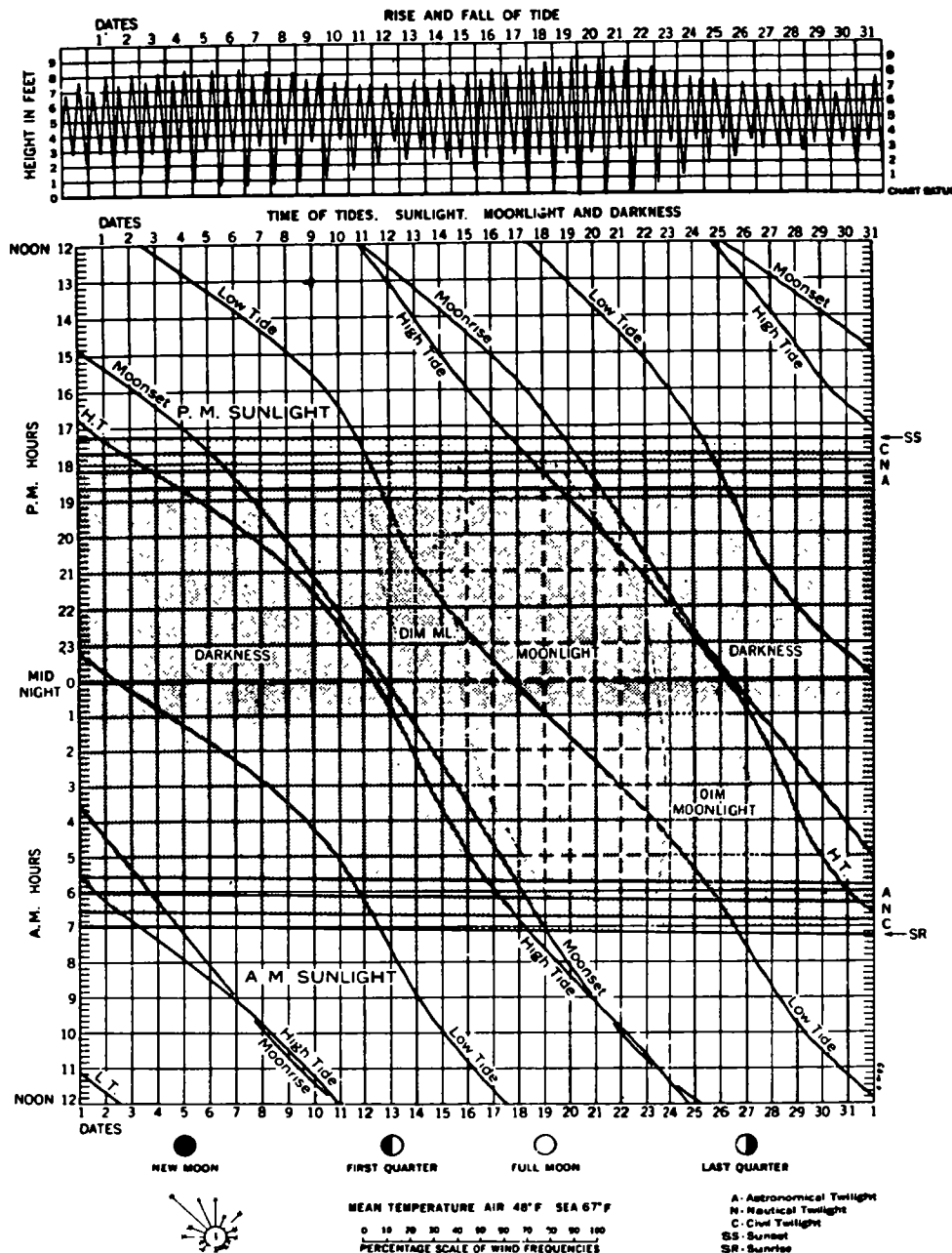
KAGOSHIMA—WAN, KYUSHU *

Lat 31° 30' N., Long 130° 40' E.

DECEMBER 1945

Time Meridian: 135° E.

Sunlight and Moonlight Data Computed for Lat 31° 30' N., Long 130° 40' E.



*This diagram, with the changes indicated, is also applicable to the following places:
TOMARI URA.—Add 10 minutes to times of high and low tides, subtract ½ foot from heights of high tides.
ODOMARI WAN.—Subtract 25 minutes from times of high and low tides, subtract 1 foot from heights of high tides.

Figure 2-12. Diagram of tides, sunlight, and moonlight.

a.m. on the 19th of the current month, Greenwich civil time. Any other suffix used after a four-digit time group (corresponding to the Z of Greenwich civil time) indicates the zone in which the local civil time is expressed. *It does not designate location on the earth's surface.* The proper suffix can be determined from the time zone chart and the time conversion chart in figures 2-10 and 2-11 respectively. For example, Kansas City is located in the sixth time zone west of Greenwich. If Kansas City keeps local civil time, the time group suffix will be S.

2-28. Expressing Natural Phenomena

a. *General.* Staff officers avoid the use of such indefinite terms as "first light," "last light," "day-break," "daylight," "dusk," and "dawn." Terms of a definite nature, such as "beginning" or "ending of evening" or "morning nautical" or "civil twilight," are preferred. However, expressions of these times to lower units must be in clock time. "First light" and "last light," terms used by the armed forces of the United Kingdom, include a slightly greater period of twilight than defined by civil twilight.

b. *Published Data.* For purposes of military planning and to facilitate staff work in expressing natural phenomena in time, theater commanders prepare and publish for the theater as a whole or for major geographic portions thereof daily time, sunrise, sunset, twilight, moon, and tide tables and specify the number of hours the local time differs from Greenwich civil time. A sample of the type of chart that should be prepared and issued for each major operation or operational area is shown in figure 2-12. These data are available through Army channels. Data on time of sunrise, sunset, morning and evening twilight, and moon phases can also be found in TM 5-236-series (current year).

(1) *Datum.* The astronomical data are for sea level and will not vary more than 5 minutes for each degree of the difference in longitude from the standard meridian.

(2) *Time used.* The times on the diagram are for the time meridian indicated in the heading. When another time meridian is to be used in the field, change the figures representing hours on the left of the large diagram to conform to the new time. If the time meridian to be used is east of the one shown on the diagram, increase the figures by 1 hour for each 15°; if west, decrease the figures.

(3) *Dates.* In the upper diagram, each day from midnight to midnight is represented by a space between two lines. In the lower diagram,

the days are represented by vertical lines covering the period from noon of one day to noon of the next. The dates at the bottom of the diagram differ from those at the top because the date changes in passing through midnight.

(4) *Tides.* The times of the high and low tides are shown by curves in the lower graph of the diagram in figure 2-12. By noting the sequence of the tides during a day, the height of any particular tide can be found from the upper graph of this diagram.

(5) *Moonlight.* For astronomical twilight and solar darkness, periods of moonlight and dim moonlight are shown on the lower diagram. During the period of moonlight, the intensity of light varies between the brightness of the full moon at zenith and one-third of this value. During the period of dim moonlight, the intensity varies from one-third to one-tenth of the brightness of full moon at zenith.

(6) *Moon's phases.* The phases of the moon are shown below the day on which they occur.

c. Twilights.

(1) Twilights (fig. 2-13) are the periods of solar illumination before sunrise and after sunset. Both morning and evening twilights are divided into three periods: astronomical, nautical, and civil. The interval between the instant that the upper edge of the sun's disk appears on the horizon and the instant that the center of the sun is 6° below the horizon is civil twilight, 6°-12° nautical twilight, and 12°-18° astronomical twilight.

(2) Astronomical twilight affords such meager light that for military purposes it may be considered a period of darkness.

(3) Nautical twilight provides enough illumination to carry on most types of ground movement without difficulty and approaches conditions expected under full light of day. Vision is limited to 365 meters or less. For military purposes, during the nautical twilight periods weapons can be employed within the range of vision stated and daylight calculations relative to movement will apply, including restrictions on such movement. Bomb loading and repair work cannot be carried on without the use of artificial light.

(4) Civil twilight affords sufficient light to carry on normal day activities. This period is the earliest or latest that provides sufficient natural illumination of targets to allow efficient observed artillery fire or day bombing.

(5) Except for high latitudes, values for the approximate durations of astronomical, nautical, and civil twilights may be considered equal.

d. *Effect of Weather on Light.* Weather has

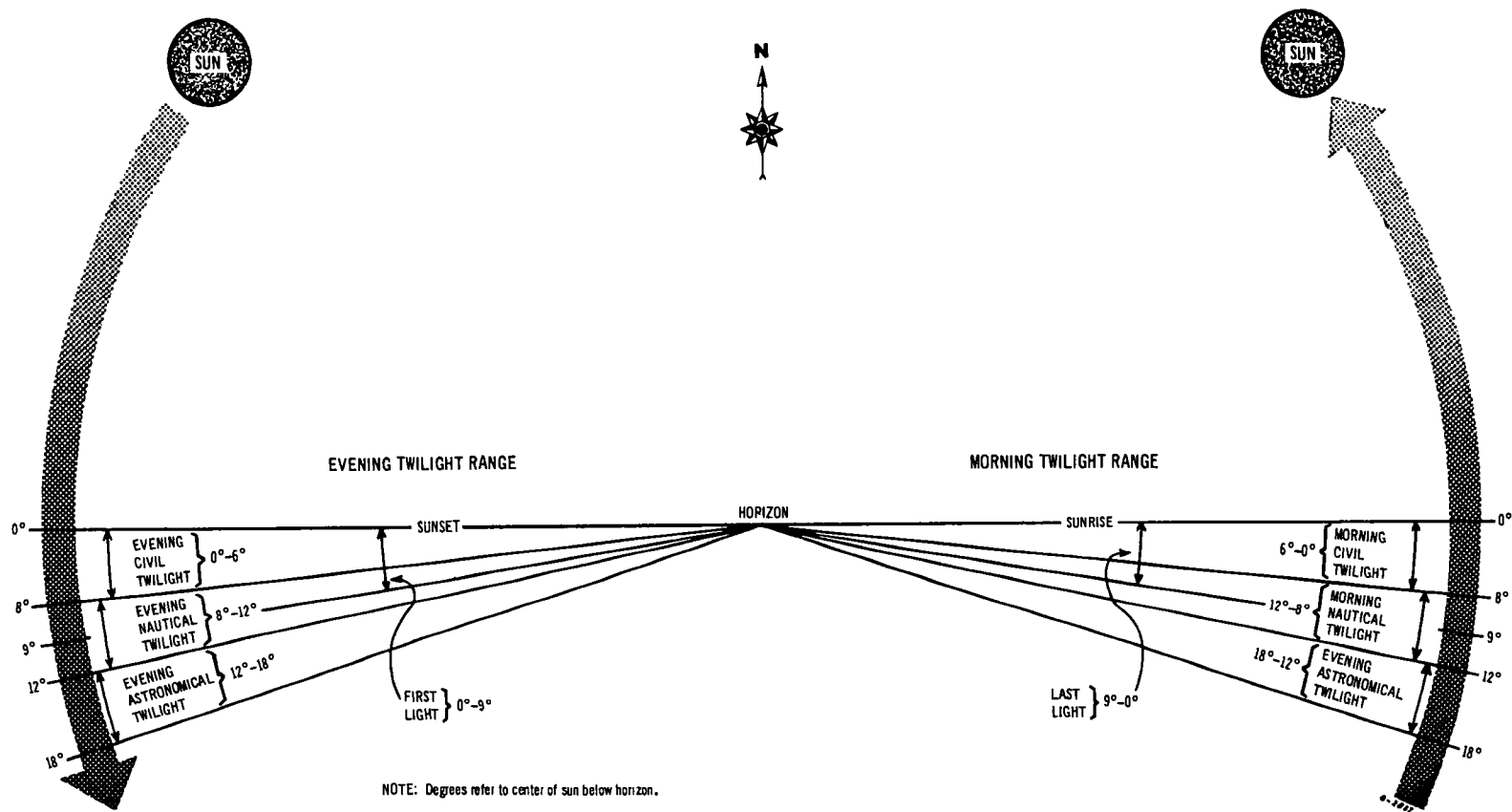


Figure 2-13. Twilight factors.

been disregarded in the above considerations. Smudge, fog, clouds, refraction, reflection, and precipitation affect the degree of illumination. These factors can be included in the calculations by experience tables compiled in the area over a period of time and from meteorological forecasts for the area only.

2-29. The World Geographic Reference System

a. The World Geographic Reference System (GEOREF) is used in all joint air defense operations. Army air defense uses the GEOREF on early warning plotting boards and on plan position indicator (PPI) screens and for reporting installation locations and target positions.

b. The GEOREF is a worldwide position reference system that may be applied to maps or charts graduated in latitude and longitude regardless of projection. It is a method of expressing latitude and longitude suitable for rapid reporting and plotting.

c. Mobile air defense units are required to report to higher headquarters any new position occupied in GEOREF coordinates.

d. The GEOREF Identification Code:

(1) The GEOREF system uses an identification code that is divided into three main divisions. The GEOREF designations are read by the same rule as military coordinates: right, then up. The complete GEOREF coordinate is expressed by combining the identification letters for the first and second divisions with the numbers identifying the third division.

(2) In a GEOREF coordinate designation, the first pair of letters identifies the first division, 15° quadrangles, within which a point is located. The first division (15° quadrangles) is subdivided into the second division, 1° quadrangles, which are identified by the second pair of letters. The second division (1° quadrangles) is further subdivided into the third division, 1° quadrangles, which are identified by a pair of two-digit numerals.

(3) The first division quadrangles are constructed by dividing the surface of the earth into 24 longitudinal zones of 15° each and 12 lateral bands of 15° each. The 24 longitudinal zones, identified by the first letter of a GEOREF designation, are lettered A through Z (omitting I and O) east-

ward from the 180th meridian. The 12 bands of latitude, identified by the second letter, are lettered A through M (omitting I) northward from the South Pole.

(4) The second division quadrangles are constructed by subdividing each of the 15° quadrangles into 15 longitudinal zones of 1° east and west and 15 latitudinal bands of 1° north and south. The longitudinal zones, identified by the third letter of a GEOREF designation, are lettered west to east from A through Q (omitting I and O). Similarly, the latitudinal bands identified by the fourth letter, are lettered south to north from A through Q (omitting I and O).

(5) The third division quadrangles are constructed by subdividing each of the 1° quadrangles into 60 longitudinal zones of 1' east and west and 60 latitudinal bands of 1' north and south. The longitudinal zones, identified by the first pair of digits of the numerical portion of the GEOREF designation, are numbered west to east from 00 through 59. The latitudinal bands, identified by a second pair of numerals, are numbered south to north from 00 through 59. The numerical designation of the third division of the GEOREF expresses the location in minutes for points located north in latitude or east in longitude. For points located south in latitude or west in longitude, the location in minutes is rounded to the next higher minute, subtracted from 60, and recorded as the third division of the GEOREF.

(6) The manner of lettering and numbering does not vary whether the location is west or east of the prime meridian or north or south of the Equator. A third division quadrangle encompasses an area approximately 1 nautical mile at the Equator to zero at the poles.

(7) *Example:* The geographic coordinates of El Paso, Texas, are 31°48'06" N and 106°25'48" W. These coordinates are rounded off to 31°48' N and 106°26' W. The first division (15° quadrangle) is identified by the letters EJ; the second division (1° quadrangle) is identified by the letters PB; the third division is derived by subtracting 26 from 60 to record 34 for the GEOREF designation of the longitudinal zone, west longitude, and 48 for the latitudinal band, north latitude. Thus, the complete GEOREF coordinates are expressed EJPB3448. FM 44-1 contains a more detailed description of this system.

Section IV. WEAPON CHARACTERISTICS

2-30. Characteristics of Weapons

a. The tables below provides the characteristics of weapons in the following categories:

(1) Vehicular weapons, combat vehicles (less artillery) (table 2-26).

(2) Infantry weapons (table 2-27).

(3) Field artillery cannons and rockets (table 2-28).

(4) Field artillery missiles (table 2-29).

(5) Field artillery final protective fires (table 2-30).

(6) Field artillery targets (table 2-31).

(7) Airmobile weapons/armament subsystems (table 2-32).

b. Definitions pertaining to characteristics of weapons are as follows:

(1) *Maximum range* — The greatest distance a weapon will fire without consideration of dispersion. It is estimated at 45° elevation for vehicular weapons.

(2) *Maximum rate of fire* — The greatest rate at which a well-trained gunner can fire.

(3) *Sustained rate of fire* — The rate at which a weapon can fire indefinitely without seriously overheating.

(4) *Maximum effective rate of fire* — The rate at which a trained gunner can fire and obtain a reasonable number of hits (50 percent).

(5) *Maximum effective range* — The maximum distance at which a weapon may be expected to deliver its destructive charge with the accuracy specified to inflict prescribed damage.

(6) *Maximum rate of fire in rounds per minute* — In table 2-27 only this rate is based on a 3-minute period.

(7) *Time to emplace in minutes* — The time needed to enter a minimally prepared position and report "laid and ready to fire."

(8) *Field artillery final protective fire* — An immediately available prearranged barrier of fire designed to impede enemy movement across defensive lines or areas. Data in table 2-30 is approximate and will vary for different charges and terrain.

(9) *Effectively covered area* — That area in which there is at least a 50-percent chance that a man standing will become a casualty. The area is roughly elliptical.

c. In table 2-32, line 6 the conservative maximum range corresponding to old rocket motors (more than 4 years old) is given. For newer rockets the maximum range is 9,200 meters.

d. Characteristics of air defense artillery and some details of field artillery rockets and missiles are contained in FM 44-1A, FM 44-96A, and FM 101-10-3.

e. Nuclear effects data are contained in FM 101-31-2.

Table 2-26. Characteristics of Vehicular Weapons and Primary Combat Vehicles

1	Line item number	Vehicle	Primary weapon	Rate of fire (rd per min)	Maximum range (m)	Effective range (m)		Approx bursting area (m)
						Armor defeating	Other targets	
2	D10725	Carr 81-mm mort, SP.....	Mort, 81-mm	Normal—18 Max—30	HE—3,100 (approx) Illuminating— 2,300 Smoke—2,450 (approx)	-----	-----	25 by 20 (A)
3	D10740	Carr 107-mm mort, SP, full-tracked..	Mort, 107-mm	Normal—5 Max—20	HE—4,925 Cml—4,625 Illuminating— 4,725	-----	-----	40 by 15 (A)
4	D11620	Carrier, flamethrower, M132A1.....	Flamethrower, mech, main armt, APC-mtd, M10-8.	6.2 gal per sec	183	-----	-----	-----
5	J96819	Gun, 40-mm, SP, M42A1.....	Gun, 40-mm, M2A1.	240	HE-T Vert—4,650 Horiz—4,775	-----	1,650 (aerial tgts)	-----
6	J96956	Gun, 90-mm, SP, full-tracked, M56..	Gun, 90-mm	NA	19,870	2,000-AP-T	4,600-HE 4,600-smoke	37 by 6 (HE)
7	V12826	Tk, cbt, full-tracked, 76-mm gun....	Gun, 76-mm	NA	14,388	2,000-AP-5 2,000-HEAT	4,600-HE 4,600-smoke 185-canister	30 by 5 (HE)
8	V12963	Tk, cbt, full-tracked, 90-mm gun....	Gun, 90-mm	NA	19,870	2,000-AP-T 2,000-HEAT	4,400-HE 4,400-smoke 185-canister	37 by 6 (HE)
9	V13100	Tk, cbt, full-tracked, 105-mm gun...	Gun, 105-mm	NA	9,500-HEP-T at 37° elev.	2,000-HEAT 2,000-ADPS-T	4,400-HEAT	40 by 8 (HEP-T)
10	V13237	Tk, cbt, full-tracked, 120-mm gun...	Gun, 120-mm	NA	17,700-HE 23,130-AP-T	-----	-----	-----
11	Z32321	GM sys, AD, Chaparral (XM48)....	Msl	NA	Classified	Classified	Classified	Classified
12	J95530	Shillelagh msl sys, XMGM-57A.....	Msl	Classified	Classified	Classified	Classified	Classified
13	J95525	TOW msl sys.....	Msl	Classified	Classified	Classified	Classified	Classified

Table 2-27. Characteristics of Infantry Weapons

1	2	3	4	5	6	7	8
Line item number	Weapon	Cyclic (C) or maximum (M) rate of fire (rd per min)	Sustained rate of fire (rd per min)	Maximum effective rate of fire (rd per min)	Maximum range (m)	Maximum effective range (m)	Approx effective bursting area (m)
2	G22109 Disperser, riot con agt, hel- or veh-mtd, M5-----	Continuous discharge 120 sec	Continuous discharge 120 sec	Continuous discharge 120 sec	12 (in still air with gun)	12 (in still air with gun)	NA
3	G22246 Disperser, riot con agt, ptbl, M3-----	Continuous discharge 19 sec	Continuous discharge 19 sec	Continuous discharge 19 sec	12 (in still air)	14 (in still air)	NA
4	H68063 Flamethrower, ptbl, M2A1-7-----	Continuous discharge 8 sec	Continuous discharge 8 sec	Continuous discharge 8 sec	Unthickened fuel-25 Thickened fuel-50	Unthickened fuel-25 Thickened fuel-50	NA
5	H68063 Flamethrower, ptbl, ABC, M9-7-----	Continuous discharge 8 sec	Continuous discharge 8 sec	Continuous discharge 8 sec	Unthickened fuel-25 Thickened fuel-50	Unthickened fuel-25 Thickened fuel-50	NA
6	J95349 GM, at, with HEAT, 130-mm whd (Entac)-----	2-3	2-3	-----	2,000	2,000	NA
7	J95359 GM, at, with HEAT, 140-mm whd (M22B)-----	-----	-----	-----	Classified	Classified	NA
8	L44575 Lchr, gren, 40-mm, M79-----	-----	-----	-----	400	Pt tgts-150 Area tgts-350	6
9	L45260 Lchr, rkt, 3.5-in, M20A1-----	18	4	-----	825	Armor defeating 185-moving; 275-stationary Other tgts-275	18 by 9 (HEAT)
10	L90742 Mg, cal .30, lt, flex, M1919A6-----	600-675 (C)	75	150	3,200	1,100	NA
11	L91975 Mg, cal .50, hv, flex, M2-----	450-500	40	100	6,800	AD tgts-725 Gnd tgts-1,825	NA
12	L92386 Mg, 7.62-mm, lt, flex, M60-----	550 (C)	100	200 (rapid rate)	3,725	1,100	NA
13	M68008 Mort, 81-mm, on mount, M29-----	12 (M) for first 2 min with charge 8	3 with charge 8	12 (M) for first 2 min with charge 8	3,650	3,650	25 by 20 (A)
14	Mort, 107-mm, on mount, M30-----	20 (M) for first 2 min, 6 for next 20 min	2	20 (M) for first 2 min, 6 for next 20 min, 2 in-definitely	5,500	5,500	40 by 15 (A)
15	N96741 Pistol, cal .45, auto-----	35-42 (M)	10	21-28	1,500	50	NA
16	R94977 Rifle, 5.56-mm, M16A1-----	750 (C) 45-65 (M) semi-automatic 150-200 (M) auto	Semiautomatic-12-15 Auto-20	Semiautomatic-20-40 Auto-40-60	2,653	460	NA
17	R95114 Rifle, 7.62-mm, M14-----	700-750 (C)	Semiautomatic-15 Auto-20	Semiautomatic-20-40 Auto-40-60	3,725	460	NA
18	R95525 Rifle, col .30 M1-----	-----	8-10	16-24	3,200	460	NA
19	R96073 Rifle, cal .30, auto-----	350 (C) slow rate 550 (C) fast rate 120-150 (M)	40-60	120-150 (20-rd bursts)	2,750-3,200	460	-----

Table 2-27. Continued

1	2	3	4	5	6	7	8
Line item number	Weapon	Cyclic (C) or maximum (M) rate of fire (rd per min)	Sustained rate of fire (rd per min)	Maximum effective rate of fire (rd per min)	Maximum range (m)	Maximum effective range (m)	Approx effective bursting area (m)
20	R96484 Rifle, rcl, 90-mm, M67-----	1 per 6 sec not to exceed 5, then 15 min cooling period	1 per min indefinitely	-----	2,200 (approx)	Armor defeating—400 Other tgts—750	-----
21	R96758 Rifle, rcl, 106-mm, on mount-----	1 per sec not to exceed 5, then 15-min cooling period	1 per min indefinitely	-----	7, 678	Armor defeating: 1,100—moving 1,100—stationary Other tgts— 2,200	14-m radius (HEP-T)
22	U56346 Smg, cal .45, M3A1-----	450 (C)	40-60	40-60	1,550	100	NA
23	Hand gren-----	NA	NA	NA	M26A2-40 M34-35	M26A2-40 M34-35	M26A2-15
24	Redeye msl sys-----	1 per 11-15 sec	-----	-----	Classified	Classified	-----

Table 2-28. Field Artillery Cannons and Rockets

Table 2-28. Field Artillery Cannons and Rockets																											
1		2		3		4		5		6		7		8		9		10		11		12		13		14	
1	Line item number	Weapon	Travel weight (lb)	Maximum range (m)	Time to emplace (min)	On carriage traverse (mils)	Elevation limits (mils)	Rate of fire (rd per min)		Effective area covered by impact (m)			Air transportability phase	Water-crossing capability													
								Maximum	Sustained	Depth	Width	Radius of large fragments															
2	J97230	Gun, FA, SP, 175-mm.	62,100	32,700	3	1,066	+35— +1,156	1.5-----	0.5-----	35	95	518	III	Fordable 42-in.													
3	K56981	How, hv, SP, 8-in, M110.	58,500	16,800	2	1,066	+35— +1,156	1.5-----	0.5-----	30	80	470	III	Fordable 42-in.													
4	K57118	How, hv, towed, 8-in, M115.	29,700	16,800	20	1,066	-36— +1,156	1.5-----	0.5-----	30	80	470	III	Fordable 60-in.													
5	K57255	How, lt, SP, 105-mm, M108.	46,221	11,500	1	6,400	-106— +1,333	10-----	3.0-----	20	30	175	III	Amph with kit.													
6	K57392	How, lt, towed, 105-mm, M102.	3,140	11,500	4	6,400	-89— +1,333	10-----	3.0-----	20	30	175	I	Floatable.													
7	K57529	How, lt, towed, 105-mm, M101A1.	4,980	11,000	3	809	-89— +1,156	10-----	3.0-----	20	30	175	I	Floatable.													
8	K57666	How, mdm, SP, 155-mm, M109.	52,460	14,600	1	6,400	-53— +1,333	4-----	1.0-----	30	50	360	III	Amph with kit.													
9	K57803	How, mdm, towed, 155-mm, M114A1.	12,700	14,600	5	866	0— +1,156	4-----	1.0-----	30	50	360	I	Fordable 30-in.													
10	K57940	How, mdm, towed, 155-mm, M123A1.	13,540	14,600	5	866	0— +1,156	4-----	1.0-----	30	50	360	I	Fordable 30-in.													
11	L45123	Lchr, rkt, multiple, 115 mm, M91.	1,200	10,600	30	356	0— +1,067	15 sec 45 rd.	15 sec 45 rd.	50 percent of rds— 25 hectares. 95 percent of rds— 114 hectares.			I	Fordable 30-in.													
12		Lchr, rkt, HJ, MGR-1B, M50.	4,719	38,000	(b)	533 356	+71— +1,067	3 per lchr per hr.	3 per lchr per hr.	-----			II	30- to 60-in.													

• Extended range.

b See FM 6-61 for time.

• M33 lchr.

Table 2-29. Field Artillery Missiles

Table 2-29. Field Artillery Missiles													
1	1	2	3	4	5	6	7	8	9	10	11		12
	Weapon	Minimum and maximum range (nm)	Water-fording capability (in.)	Guidance	Propulsion	Mobility	Missile prime mover	Field of fire (mils from cen)*	Launch elevation (mils)	Length (m)	Missile weight (lb)		Diameter (in.)
											With warhead	Without warhead	
2	PERSH.....	100 to 400	42	Inertial....	2-stage solid.	Veh—100 percent. Air—ph II.	XM474E2 (tracked veh).	2,225 (right and left).	1,600	10.5	10,275	9,500	40
3	SGT.....	25 to 75	30	Inertial....	Solid.....	Veh—100 percent. Air—ph II.	Trac, 5-ton, M52.	3,11 (right and left).	1,333	10.5	10,022	8,411	30

*Fields of fire indicate system capabilities to attack targets without repositioning the launcher once it has been emplaced.

Table 2-30. Field Artillery Final Protective Fires

TABLE 2-55. Field Artillery 1 and 3 Caliber Pieces															
1		2		3		4		5		6		7		8	
1	Weapon (caliber and type)	Area effectively covered by one projectile (width by depth)	Radius of large fragments (m)	Front of battery sheafs			Permissible Number of rounds per piece								
				Size of battery			Maximum (rd per min)	Sustained (rd per min)							
				2-piece	4-piece	6-piece									
2	105-mm how	30 by 20	174	.....	.....	180	M101A1—10			3.0					
							M108—10			3.0					
							M102—10			3.0					
3	155-mm how	50 by 30	357	.....	.....	300	M114A1—4			1.0					
							M109—4			1.0					
							M115—1.5			0.5					
4	8-in how	80 by 30	476	.....	320	.....	M110—1.5			0.5					
							M107—1.5			0.5					
5	175-mm gun, M107	95 by 35	520	.....	380	.....	M107—1.5			0.5					

Table 2-31. Field Artillery Targets

1	Area and ammunition	2		3		4		5	
		Unit		Unit		Unit		Unit	
		105-mm bn	155-mm bn	175-mm bn	8-in bn	105-mm bn	155-mm bn	175-mm bn	8-in bn
		6-piece btry	6-piece btry	4-piece btry	4-piece btry				
2	Approx size of area covered (m)*	220 by 160	350 by 210	420 by 140	340 by 140				
3	Amount of ammo to cover (rd)	72	72	60	60				

* The area covered effectively is considered that area in which there is at least 50-percent chance that a man standing will become a casualty. The area is roughly elliptical.

Table 2-32. Characteristics of Airmobile Weapon/Armament Subsystems

Table 2-32. Characteristics of 21mm-class W. Weapon/21mm-class Subsystems										
1		2	3	4	5	6	7	8	9	10
1	Line item number	Weapon and ammunition	Mounted on	Rate of fire (rd per min)		Range (m)		Bursting radius (m)	Ammo capacity (rd)	Total weight (lb)
				Cyclic	Maximum	Maximum	Maximum effective			
2	A90154	XM27; mg-hr (high rate) 7.62-mm	LOH		2,000				2,000	276
3	A90169	TAT 102, mg-hr 7.62-mm	AH-1G		4,000				8,000	
4	A90186	M2, dual mg, 7.62-mm	OH	1,100	1,100	3,200	750		1,100	163
5	A90323	M6, quad mg, 7.62-mm	UH-1	2,200	2,200	3,200	750		6,700	629
6	A90391	M16, 1 ea M-6 subsys, plus 2 ea 2.75-in rkt lchr	UH-1B		6 Pair/sec ^a	7,500 ^a	2,500 ^a	6 ^b	14 ^a	1,268
7	M21, 2 ea	2.75-in rkt lchr, plus 2 ea 7.62-mm mg-hr	hel		4,000 ^c				6,350 ^c	1,268
8	A90436	XM28, mg-hr plus 1 ea M-5 subsys	AH-1G		(^d)	(^d)	(^d)	(^d)	4,000 MG 250 Gren	(^d)
9	A90460	M5, gren lchr, 40-mm	UH-1B	220/240	220	1,750	1,200	10	150	336
10	A90597	XM3, rkt lchr, 2.75-in	UH-1B		6 Pair/sec	7,500	2,500	6 ^b	48	1,324 ^b
11		M22, msl AGM-22B	UH-1B		1/23 sec	3,500	3,500		6	650

^a Applies to rkts. For M6, see line 5.

^b 6.45-lb warhead.

^c Applies to mg, 7.62-mm. For rkts, see line 6.

^d One of each (or both of either). See lines 2 and 9 for additional characteristics.

2-31. Characteristics of Chemical Agents and Munitions

Tables 2-33 and 2-34 provide data on characteristics of chemical agents and munitions respectively.

Table 2-33. Characteristics of Chemical Agents

1	1 Name and symbol	2 Odor	3 Effect on body	4 Persistency effect	5 Possible dispersion methods
<i>Toxic chemical agents</i>					
2	Distilled mustard, HD ¹	Like garlic or horseradish.	Injures eyes and lungs; blisters skin.....	Up to several weeks.....	Artiller, bomb, landmine, mortar, rocket, spray.
3	Nerve agent, GB ¹	Odorless.....	Causes blurred vision with pinpointing of pupils, skin and eye spasms, difficult breathing, tightness in chest, salivation, mental confusion, convulsions, death.	Up to 12 hours.....	Artillery, bomb, landmine, mortar, rocket, spray.
4	Nerve agent, VX.....	Odorless.....	Similar to effects from GB.....	Long duration.....	Rocket, mine, artillery, mortar.
<i>Incapacitating agents</i>					
5	O-chlorobenzalmononitrile, CS.....	Like pepper.....	Causes tears; irritates skin; and acts as a vomiting agent. May cause temporary pain in chest.	.....	Candle, grenade, mechanical disperser.
6	Incapacitating agent, BZ.....	.....	Causes temporary slowing of mental and physical activity, disorientation, and hallucinations.	.....	Bomb, thermal generator.
<i>Screening smokes</i>					
7	Hexachlorethane-zinc oxide mixture, HC. ²	Slightly acid.....	30-minute exposure to ordinary concentration harmless; 1-hour exposure to heavy concentration may irritate nose and throat and cause illness; heavy metal poisoning possible with prolonged exposure.	Subject to atmospheric conditions.	Artillery, bomb, grenade, mortar, pot, rocket.
8	Sulfur trioxide in chlorosulfonic acid, FS. ²	Acrid.....	Smoke not toxic in ordinary concentration; high concentration irritates eyes, throat, and chest and may cause illness; liquid is corrosive and burns skin.	Subject to atmospheric conditions.	Artillery, mortar, rocket, spray.
9	Fog oil, SGF ^{2,3}	Like petroleum oil.	Prolonged exposure can irritate lungs and throat.	Subject to atmospheric conditions.	Smoke generator, grenade, pot.
10	White phosphorus, WP ⁴	Like burning matches.	Smoke is harmless; solid particles burn flesh....	Subject to atmospheric conditions.	Artillery, bomb, grenade, mortar, rocket.
11	Plasticized white phosphorus, PWP.....	Like burning matches.	Same effect on body as WP.....	2-3 minutes.....	Artillery, bomb, grenade, mortar, rocket.
<i>Signaling smokes</i>					
12	Green smoke, GS.....	Acrid.....	.....	Subject to atmospheric conditions.	Artillery, bomb, grenade.
13	Red smoke, RS.....	Acrid.....	.....	Subject to atmospheric conditions.	Artillery, bomb, grenade.
14	Violet smoke, VS.....	Acrid.....	.....	Subject to atmospheric conditions.	Artillery, bomb, grenade.
15	Yellow smoke, YS.....	Acrid.....	.....	Subject to atmospheric conditions.	Artillery, bomb, grenade.

¹ Requires protective clothing and mask.² Mask required in dense concentrations.³ Used when air temperature is between -18° and 5° C.⁴ Secondary tactical classification is an antipersonnel agent; agent also has some incendiary effect.

Table 2-34. Characteristics of Chemical Munitions

1	2	3	4	5	6	7	8
Line item number	Munition	Agent symbol	Weight of filled munition (lb)	Burning time (min)	Radius of burst (m)	Number and color of bands	Standard color coding system Base (primary use)
<i>Hand grenades</i>							
2	J77626 Gren, hand, green-smoke, M18	GS	1.20	1	NA	None	Light-green background; black lettering.
3	J77763 Gren, hand, incd, TH3, AN-M14	TH3	2.00	1/2	NA	None	Light red; black lettering.
4	J78757 Gren, hand, riot con, type CS1, M25A2	CS1	0.50	NA	5	1 red	Gray; red lettering.
5	J79133 Gren, hand, red-smoke, M18	RS	1.20	1	NA	1 light green	Olive drab; light-green lettering.
6	J79270 Gren, hand, riot, CN1, ABC, M25A2	CN1	0.50	NA	5	1 red	Gray; red lettering.
7	J79544 Gren, hand, riot, CS, M7A3	CS	1.00	1/4 to 1/2	NA	1 red	Gray; red lettering.
8	J79681 Gren, hand, smoke, ABC, AN-M8	HC	1.60	2	NA	None	Light green; black lettering.
9	J79818 Gren, hand, violet-smoke, M18	VS	1.20	1	NA	1 light green	Olive drab; light-green lettering.
10	J79955 Gren, hand, yellow-smoke, M18	YS	1.20	1	NA	1 light green	Olive drab; light-green lettering.
11	J80092 Gren, hand and rifle, smoke, WP, M34	WP	1.69	1	35	1 yellow	Light green; light-red lettering.
<i>Flamethrower</i>							
12	K67817 Ignition cyl, flamethrower, M1	NA	0.10	1/10 to 1/5	NA	None	Light red; black lettering.
<i>Incendiaries</i>							
13	C39059 Burster, incd, fld, M4	Incd	2.25	NA	35	1 yellow	Light red; black lettering.
14	F52132 Crypto equip destroyer, incd, TH4, M1A2, M2A1	TH4	34.00	1	NA	None	Light red; black lettering.
15	G33515 Docu destroyer, emerg, incd, M3	Incd	117.00	20	NA	None	Light red; black lettering.
16	H40472 File destroyer, emerg, M3	Incd	117.00	20	NA	None	Light red; black lettering.
<i>Landmine</i>							
17	M48959 Mine, gas, persistent, VX, 2-gal, ABC and M23	VX	22.75 (unfuzed)	NA	NA	3 green, 1 yellow	Gray; green lettering.
<i>Smokepots and signals</i>							
18	T52025 Sig, gnd, green-smoke, prcht, M128E1	GS	1.16	1/4	NA	None	Light green; black lettering.
19	T52162 Sig, gnd, red-smoke prcht, M129E1	RS	1.16	1/4	NA	None	Light green; black lettering.
20	T84505 Smokepot, HC, 30-lb, M5	HC	33.00	12 to 22	NA	None	Light green; black lettering.
21	T84657 Smokepot, fltg, HC, M4A2	HC	38.00	10 to 15	NA	None	Light green; black lettering.
<i>Fire starter</i>							
22	U30201 Starter, fire, NP3, M2	NP3	0.03	4	NA	None	Light red; black lettering.
<i>Rockets</i>							
23	S03725 Rkt, gas, nonpersistent GB, 115-mm, M55	GB	55.00	NA	NA	3 green, 1 yellow	Gray; green lettering.
24	S03862 Rkt, gas, persistent, VX, 115-mm, M55	VX	56.00	NA	NA	3 green, 1 yellow	Gray; green lettering.
<i>81-mm mortar</i>							
25	D50165 Ctg, 81-mm, smoke, WP M370	WP	9.34	NA	20 to 30	None	Light green; light-red lettering.
<i>90-mm gun</i>							
26	D51535 Ctg, smoke, WP, 90-mm gun, M313	WP	23.64	NA	15 to 30	None	Light green; light-red lettering.
27	D51672 Ctg, 90-mm, smoke, WP, M313C	WP	23.57	NA		None	Light green; light-red lettering.
<i>105-mm howitzer</i>							
28	D54275 Ctg, 105-mm, gas, HD, M60	HD	43.27	N1	NA	2 green	Gray; green lettering.
29	D54412 Ctg, smoke, WP, 105-mm how, M60	WP	34.83	NA	20 to 40	None	Light green; light-red lettering.
30	D54960 Ctg, green-smoke, BE, 105-mm how, M84	GS	30.48	1 to 4	NA	None	Light green; white lettering.
31	D55097 Ctg, smoke, HC, BE, 105-mm how, M84	HC	32.86	1 to 4	NA	None	Light green; white lettering.
32	D55234 Ctg, red-smoke, BE, 105-mm how, M84	RS	30.68	1 to 4	NA	None	Light green; white lettering.
33	D55508 Ctg, yellow-smoke, BE, 105-mm how, M84	YS	30.29	1 to 4	NA	None	Light green; white lettering.

Table 2-34—Continued

1	Line item number	Munition	Agent symbol	Weight of filled munition (lb)	Burning time (min)	Radius of burst (m)	Standard color coding system	
							Number and color of bands	Base (primary use)
34	D56878	Ctg, gas, nonpersistent, 105-mm how M360	GB	35.59	NA	NA	3 green	Gray; green lettering.
35		Canister, green-smoke, 105-mm shell, M2	GS	40.30	2	NA	None	Light green; black lettering.
36		Canister, red-smoke, 105-mm shell, M2	RS	40.50	2	NA	None	Light green; black lettering.
37		Canister, smoke, HC, 105-mm shell, M1	HC	42.70	3	NA	None	Light green; black lettering.
38		Canister, violet-smoke, 105-mm shell, M2	VS	40.30	2	NA	None	Light green; black lettering.
39		Canister, yellow-smoke, 105-mm shell, M2	YS	40.10	2	NA	None	Light green; black lettering.
<i>Miscellaneous</i>								
40	D41048	Ctg, 40-mm: red smoke, fill f/1chr M79	RS				None	Bright red; black lettering.
41	D41052	Ctg, 40-mm: riot control CS fill f/1chr	CS		NA		1 red	Gray; red lettering.
42	D59344	Ctg, gas, persistent, HD, 4.2-in mort, M2A1	HD	23.50	NA		2 green	Gray; green lettering.
43	D59481	Ctg, smoke, WP, 4.2-in mort, M328	WP	28.66	NA	20 to 50 ^a	None	Light green; light-red lettering.
44	E42210	Cluster canister, tac CS, 130-lb, E159	CS	130			1 red	Gray; red lettering.
45	E42460	Cluster frag bomb, incapacitating M43	BZ				2 red	Gray; red lettering.
46	L43914	Lehr and 35-mm ctg, tac CS, 16-tube, E8	CS	33.5			1 red, 1 brown	Gray; red lettering.
<i>120-mm gun</i>								
47	P69501	Proj, 120-mm, smoke; WP-T, M357	WP	50.30	NA	50 ^a	None	Light green; light-red lettering.
<i>155-mm howitzer</i>								
48	P72789	Proj, gas, persistent, HD, 155-mm how, M110	HD	94.00	NA		2 green	Gray; green lettering.
49	P73063	Proj, green-smoke, BE, 155-mm how, M116B1	GS	86.44	½ to 4	NA	None	Light green; white lettering.
50	P73200	Proj, smoke, HC, BE, 155-mm how, M116B1	HC	94.35	1 to 4	NA	None	Light green; white lettering.
51	P73337	Proj, red-smoke, BE, 155-mm how, M116B1	RS	86.44	½ to 4	NA	None	Light green; white lettering.
52	P73611	Proj, yellow-smoke, BE, 155-mm how, M116B1	YS	86.44	½ to ¼	NA	None	Light green; white lettering.
53	P73885	Proj, gas, nonpersistent, GB, 155-mm how, M121A1	GB		NA	(^b)	3 green	Gray, green lettering.
54	P74022	Proj, gas, persistent, VX, 155-mm how, M121A1	VX		NA	(^b)	3 green	Gray, green lettering.
55		Canister, violet-smoke, 155-mm shell, M3	VS	86.40	1 to 3	NA	None	Light green; black lettering.
56		Canister, violet-smoke, 155-mm shell, M4	VS	86.40	½ to 3	NA	None	Light green; black lettering.
57		Canister, yellow-smoke, 155-mm shell, M3	YS	86.40	1 to 3	NA	None	Light green; black lettering.
58		Canister, yellow-smoke, 155-mm shell, M3	YS	86.40	½ to 3	NA	None	Light green; black lettering.
59		Canister, green-smoke, 155-mm shell, M4	GS	86.44	1 to 3	NA	None	Light green; black lettering.
60		Canister, green-smoke, 155-mm shell, M4	GS	86.40	½ to 3	NA	None	Light green; black lettering.
61		Canister, red-smoke, 155-mm shell, M3	RS	86.40	1 to 3	NA	None	Light green; black lettering.
62		Canister, red-smoke, 155-mm shell, M4	RS	86.40	½ to 3	NA	None	Light green; black lettering.
63		Canister, smoke, HC, 155-mm shell, M1	HC	95.10	2 to 4	NA	None	Light green; black lettering.
64		Canister, smoke, HC, 155-mm shell, M2	HC	94.35	1 to 4	NA	None	Light green; black lettering.
<i>8-in howitzer</i>								
65	P75392	Proj, gas, nonpersistent, GB, 8-in how, M426	GB		NA	(^b)	3 green	Gray; green lettering.
66	P15529	Proj, gas, persistent, VX, 8-in how, M426	VX		NA	(^b)	3 green	Gray; green lettering.

^a For antipersonnel effect.^b Information is classified.

Table 2-34—Continued

1		2		3		4		5		6		7		8	
1	Line item number	Munition	Agent symbol	Weight of filled munition (lb)	Burning time (min)	Radius of burst (m)	Standard color coding system								
							Number and color of bands		Base (primary use)						
Rocket warheads															
67	Y25286	Whd sec, 762-mm rkt, gas, nonpersistent, GB, M190	GB	1,716.00	NA	(b)	3 green, 1 yellow.	Gray; green lettering.							
68	Y26314	Whd, 2.75-in rkt, smoke	WP		NA		1 brown	Light green; light red lettering.							
69		Whd sec, GM, gas, nonpersistent, GB, M212	GB	2,069.00	NA	(b)	3 green, 1 yellow.	Gray; green lettering.							

^b Information is classified.



CHAPTER 3

COMBAT SUPPORT—SIGNAL, ENGINEER, AND BASE DEVELOPMENT

Section I. SIGNAL COMMUNICATIONS

3-1. General

a. The data are provided herein for use as general guides. The technical nature of signal operations and varying security measures require that these data be applied only as recommended by the unit signal officer after modification to local field conditions and in the light of the tactical situation.

b. For signal troop units in a typical field army, see table 1-3.

c. For signal construction factors, see paragraph 7-16.

d. Characteristics of target acquisition and combat surveillance equipment are contained in FM 101-10-3.

e. The following publications govern signal communications:

(1) Pertinent sections of the unit standing operating procedure (SOP) set forth the general principles under which the unit signal system will operate. Usually, the SOP is governed by the provisions of the SOP of the next higher headquarters and, in turn, serves as a guide for that of subordinate headquarters.

(2) The standing signal instructions (SSI) explain the use of items included in the signal operation instructions (SOI). SSI at various command echelons are identical or similar in content. Instructions that are identical in several commands are prepared and distributed by the highest common command when such centralized preparation is feasible.

(3) SOI contain the specific technical directions for the operation of the various means of signal communications. They include separate items providing such information as telephone directory code names and numbers, radio call signs and frequencies, unit code and ciphers, and pyrotechnic signals. Because changes in items of SOI occur frequently, paragraph 5 of the field order specifies the current index.

(4) Joint Army-Navy-Air Force Publications (JANAP) and Allied Communication Publications (ACP) contain joint and combined instructions, methods, and procedures pertaining to communications planning and operations.

3-2. Users Served by the Signal Communications System

The military signal communications system in a

theater of operations provides service for the following:

a. Signal communications in the combat zone.

- (1) Division.
- (2) Corps.
- (3) Field army.
- (4) Army group.

b. Signal communications in the COMMZ (FM 11-23).

- (1) TASCOR.
- (2) Personnel command (PERSCOM).
- (3) Supply and maintenance command (SMCOM).
- (4) Engineer command (ENCOM).
- (5) Transportation command (TRANSCOM).
- (6) Medical command (MEDCOM).
- (7) Area support command (ASCOM).
- (8) Interzonal services.
- (9) Other command headquarters.

c. Communications facilities as required for —

- (1) Air defense.
- (2) Coordination of Army and Air Force activities, including facilities for the request of air support.
- (3) Coordination of Army and Navy activities.
- (4) Military police (MP) activities, including traffic control.
- (5) Personnel replacement systems.
- (6) Intelligence and counterintelligence activities.
- (7) Civil affairs (CA).
- (8) Psychological operations (PSYOP).
- (9) Press, public relations, and special services activities.
- (10) Guided-missile installations and activities.
- (11) Counterinsurgency and unconventional warfare.
- (12) Interallied signal communications.
- (13) Electronic warfare.
- (14) Meteorological service.
- (15) Signal security activities.
- (16) Air traffic control.
- (17) Air navigation systems.
- (18) Identification, friend or foe, systems.
- (19) Automatic data processing systems.
- (20) Military highway communications.
- (21) Petroleum, oil, and lubricants (POL)

supply.

3-3. Field Army Communications System

a. General. The field army communications system (FACS) provides the field army commander with a reliable signal communications system with which to influence the tactical operations of subordinate units. The system also provides signal communications to combat support and combat service support units, which enable them to react rapidly and keep pace with the combat forces. The FACS consists of a command communications system and an area communications system, which are provided by the army signal brigade assigned to the field army. Each subordinate organization of the field army has sufficient signal personnel and equipment to install, operate, and maintain both a command post communications system and an area communication system. The equipment and techniques of all systems are compatible so there is a complete interface throughout the field army area.

b. Command Communications System. The command communications system is developed along command lines, from senior headquarters to each subordinate headquarters, and connects with adjacent field army headquarters and allied force headquarters or both. The system interconnects echelons of field army headquarters such as corps, field army artillery, separate division or brigade supporting field army headquarters, and other designated units.

c. Area Communications System. The area communications system provides long-distance signal communications links on an area basis for combat support and combat service support units. It also acts as a backup or alternate system for the command communications system when this system is disrupted by displacement of tactical headquarters, enemy action, natural disasters, or other causes. The area system is not limited to the boundaries of the units that it serves, but is established along several longitudinal axes with multiple lateral interconnections between signal centers. The signal centers have sufficient communications facilities to enable the movement of command posts from one location to another without disruption of the overall system and provide the maximum number of alternate routes for message handling to reduce the probability of interruption of communications between major units.

3-4. Communications Center

a. Function. The function of the communications center (COMMCEN) is to transmit, receive, and deliver messages by the most reliable means. The figures in the tables in this paragraph and in those in paragraph 3-5 apply to COMMCEN oper-

ations and are based on World War II experience. Under present and future concepts of operations, the accuracy of these figures may vary.

b. Cryptographic Operations. Table 3-1 is computed from afteraction reports of selected units in the European Theater of Operations (ETO) during World War II. It includes messages sent by radio, teletypewriter, and miscellaneous means.

Table 3-1. Cryptographic Operations

1	2	3	4	5
Item	Division	Corps	Field army	Army group
2 Average code groups per month	225,000	500,000	750,000	1,800,000

c. Precedence. Table 3-2 shows the nomenclature for classes of precedence. It was compiled from afteraction reports in the ETO during World War II and has been changed to conform to present usage.

Table 3-2. Classes of Precedence (Percentage)

1	2	3	4	5
Item	Flash	Immediate	Priority	Routine
2 Percentage of all messages (field army headquarters).	2	36	23	39

d. Speed of Transmission. Table 3-3 shows the average speed of transmission for various message media.

Table 3-3. Speed of Transmission

1	2
Method of transmission	Approximate transmission rate (WPM) ¹
2 Panels (15 code groups per hour)	0.25.
CW manual telegraph (wire or radio, one-way): ²	
3 Average operator (hand printed)	12-15.
4 Skilled operator (typewritten)	25-40.
Teletypewriter (wire or radio, one-way):	
5 Average operator (keyboard operation)	25-40.
Tape operation (on one telegraph circuit)	60 or 100.
7 Tape operation (on one voice circuit, 16 tape circuits)	960 or 1,600.
Facsimile (wire or radio, one-way, weather map-size copy or two 8 by 10 1/2 pages in 20 minutes): ²	
8 Average text per page (400 words)	40.
9 Completely filled page, no margins or blank space (1,000 words).	100.

Table 3-3. Continued

1	2
Method of transmission	Approximate transmission rate (WPM) ¹
EAM data cards (wire or radio, one-way, fully punched, 80 columns or 13 words per card):	
10 On a 60-WPM telegraph circuit....	39.
11 On a 100-WPM telegraph circuit...	65.
12 On a 3-kilohertz voice circuit (11 cards per minute).	143.
13 Maximum on voice circuit (4 by 11 cards per minute).	572.
Fielddata messages (wire or radio, one-way, 8 bits per character):	
14 Paper tape on telegraph circuit.....	60 or 100.
15 Paper tape on a 3-kilohertz voice circuit.	Up to 600.
16 Magnetic tape on average voice circuit.	Up to 1,500.
17 Magnetic tape on special voice circuit.	Up to 3,000.
18 Magnetic tape on 48-kilohertz 12-voice-channel group.	Up to 24,000.
19 Magnetic tape on 1-megahertz video circuit.	Up to 500,000.
Telephone (or voice on wire or radio, one-way):	
20 Push-to-talk operation (radio-telephone).	80-120.
21 Average talker.....	100-150.
22 Fast talker reading clear text.....	150-250.
23 Enciphered code groups using phonetic alphabet.	15-20.

¹One word equals 5 characters plus a space.²Simplex, half-duplex, one-way-at-a-time, or one-way automatic-reversible operation speeds are the same as for one-way. The total operation speed for both directions of full-duplex operation is equal to twice that of one-way operation.

3-5. Means of Signal Communications

a. General.

(1) *Military messages.* Military messages are transmitted by —

(a) Messenger, including scheduled and special foot, motor, and aircraft messengers and officer couriers.

(b) Wire circuits, including telephone, teletypewriter, and facsimile.

(c) Visual, including flags, panels, lamps, and pyrotechnics.

(d) Sound, including whistles, horns, loud-speaker systems, and small-arms fire.

(e) Radio circuits, including teletypewriter, voice, continuous wave (CW), facsimile, and data and special transmission.

(f) Ancillary devices, such as data processing and transmission facilities and special communications devices.

(2) *Use of signal communications means.* Messenger, wire, and radio are used for communications within and between division, corps, field army, and higher headquarters. Besides these means, visual and sound systems are used in air-ground signaling, in amphibious operations, for emergency communications within small units, and as warning signals.

b. Radio.

(1) *General.* The traffic handled by radio — exclusive of messages handled by radio-relay equipment installed as part of or in lieu of the wire net — depends on the type of unit and the rate of movement. In general, radio forms a standby means of communications during static conditions when its operation would provide information subject to enemy interception and analysis. However, in fast-moving situations when it is difficult to extend wire lines rapidly enough and when units disperse on a wide front, radio becomes a major means of communications.

(2) *Radio traffic.* Table 3-4 contains radio traffic data based on selected units in the ETO during World War II.

c. *Television.* Military television is currently limited to noncombat applications in the continental United States (CONUS), the communications zone (COMMZ), and United States Army, Vietnam (USARV), e.g., conference, training, and entertainment.

d. Wire.

(1) *General.* Wire communications networks generally provide a more secure means of electrical transmission of messages than radio. Relative security depends on geographic location of the net, the tactical situation, local security measures, the type of equipment being used, and the type of conductor employed in the line. The transmission of classified messages in the clear over these circuits is resorted to only when the urgency of the tactical situation outweighs the security requirements.

Table 3-4. Radio Traffic

1	2	3	4	5	6
Item	Armored division	Infantry division	Corps	Field army	Army group
2 Average messages per month.....	2,400	200	500	9,500	3,800
3 Average code groups or words per month.....		35,000	85,000	163,000	650,000

(2) *Telephone.* Each headquarters has enough telephone facilities to satisfy normal operating requirements, provided proper use is made of written messages for traffic not adapted to telephonic transmission. Table 3-5 shows the average number of calls per day handled by switchboards in major headquarters in the ETO during World War II.

Table 3-5. Telephone Traffic

	1	2	3	4	5
1	Item	Division	Corps	Field Army	Army group
2	Calls per day	2,000	5,000	12,500	18,000

(3) *Teletypewriter.* Table 3-6 shows the average number of teletypewriter messages handled by various types of headquarters in the ETO during World War II.

Table 3-6. Teletypewriter Traffic

	1	2	3	4	5
1	Item	Division	Corps	Field Army	Army group
2	Messages per month	750	4,000	11,500	28,000

(4) *Construction.* Paragraph 7-16 contains figures on permanent and semipermanent wire construction.

(a) Table 3-7 shows the rates of wire-line construction.

Table 3-7. Rates of Wire-line Construction

	1	2	3	4
1	Type of wire	Foot troops	Reel trucks	Signal construction battalion
2	Field wire	2 ½ kmph per 3-man team.	5-8 kmph per 6-man team.	
3	Spiral-4 cable (on existing support).	-----	1 ½ kmph per 8-man team.	
4	Open wire (10-wire pole line).	-----	-----	48 km per week.

(b) Table 3-8 shows the rates of construction for field wire, cable, and open wire laid to next subordinate headquarters by selected units in the ETO during World War II.

Table 3-8. World War II Experience Data on Wire-Line Construction

	1	2	3	4
1	Kilometers per month of—	Division	Corps	Field Army
2	Field wire	700	-----	-----
3	Cable and field wire	-----	1,100	2,100
4	Open wire	-----	-----	800

(c) Table 3-9 shows the average rates of repair of wire lines by a division signal company over a 6-month period in the ETO during World War II.

Table 3-9. Rates of Wire-Line Repair

	1	2	3	4
1	Item	Daylight	Night	Average time out day and night
2	Elapsed time in minutes	70	120	95

e. *Comparison Between Radio-Relay and Wire Circuit Installation Times.* Figure 3-1 shows the times including site survey and selection, travel time, equipment, and antenna installation if all sites are accessible to vehicles. Wire facilities are based on a 12-hour day, considering losses due to loading, travel, supply, and vehicle maintenance; capability is for an eight-man team.

f. *Messenger.*

(1) Table 3-10 lists the rates of travel of various types of messengers, with no consideration to traffic restrictions, climate, or weather.

Table 3-10. Rates of Travel of Messengers

	1	2	3
1	Kind of messenger	Rate of travel (kmph)	
		Day	Night
2	Dismounted (runner)	5-8	3-6
3	Motor	40-65	24-50
	Aircraft:		
4	Fixed-wing	145-260	145-260
5	Rotary-wing	96-160	96-160

(2) Each headquarters receives message deliveries. Motor messenger carries the bulk of messenger traffic. Table 3-11 indicates the capabilities of motor messenger service available to units.

Table 3-11. Messenger Traffic

	1	2	3	4
1	Item	Division	Corps	Field army
2	Kilometers of route per month	11,265	48,280	144,841
3	Pouches and messages	17,000	50,000	150,000

(3) Accounting for messages in the COMMCEN by pouch rather than by individual message increases the quantity of messages that a messenger can transmit and the speed of transmission.

3-6. Special Communications Requirements

a. *General.* Certain intersectional services require special communications facilities. When-

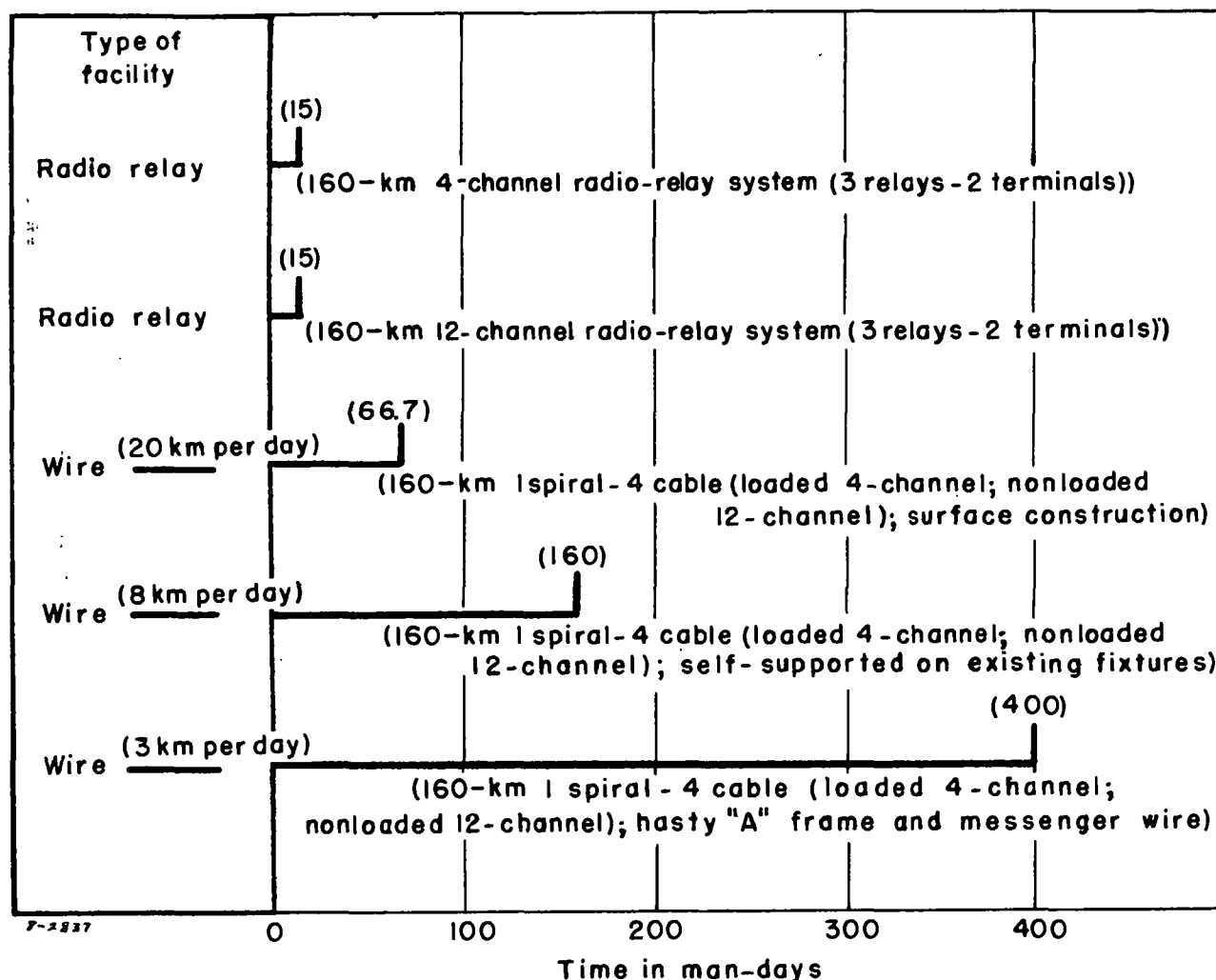


Figure 3-1. Radio-relay and wire-circuit installation times.

ever possible, these requirements are integrated into the theater army communication system (TACS). Special requirements of these services are presented in *b* through *e* below.

b. Military Railway Service Communications Data. A military railway service communications system normally consists of open wire facilities. VHF radio and VHF/UHF radio relay are *ultimate overseas necessities*.

(1) Two metallic pairs are required to provide the telephone and teletypewriter circuits needed. Open wire leads may or may not closely follow the railway, but circuits must be available at each way station and dispatcher's office.

(2) Equipment associated with open wire lines usually consists of telephone dispatching equipment, simplex and composite sets, telephone and telegraph voice-frequency repeaters and may include use of telephone carrier facilities.

(3) VHF radio may be used in railroad yard areas for yard-to-engine operation.

(4) VHF/UHF radio relay may be used between adjacent division dispatcher's offices and from division dispatcher to way stations where wire lines experience frequent outages because of hostile action and where backup communications are required. It is valuable also during operations requiring speed of installation.

(5) Circuit requirements include —

(a) Dispatcher to way stations.

(b) Way station to way station.

(c) Dispatcher to dispatcher.

1. Telephone.

2. Teletypewriter.

(d) Division headquarters to military railway service headquarters.

1. Telephone.

2. Teletypewriter.

c. Military Pipeline Communications Data.

(1) Military pipeline communications may be provided on allocated channels of the TACS. In geographic areas where it is not feasible to

use this system, a separate radio-relay system will be installed; and, when practicable, it will be integrated with the TACS.

(2) VHF radio facilities are provided at each pumping station, tank farm complex, and district dispatcher's office for communications to airmobile and ground mobile units. This equipment also provides emergency communications between these elements.

(3) High-frequency radio facilities are provided for emergency communications between the chief dispatching station and each district dispatcher.

(4) Equipment associated with the system consists of telephone dispatching systems, teletypewriter sets, simplex and composite sets, telephone and telegraph voice-frequency repeaters and may include telephone carrier systems.

(5) For planning, 65 percent of the total pipeline communications circuit requirements in an overseas theater will be provided from the TACS. This estimate is based on the assumption that the pipelines and the axes of the TACS generally coincide. The remaining 35 percent by the pipeline communications circuit requirements will be provided by the Signal Corps as separate construction to support the POL system.

d. Military Highway Communications Data.

(1) A military highway communications system usually consists of fixed VHF radio stations located at strategic intervals of from 60 to 80 kilometers. These stations may be adjacent to the traffic control posts (TCP) and highway regulation points or may be at the same location. The fixed radio stations are connected to the nearest theater army signal switching center for access to the integrated TACS. This connection also enables the strategically located highway radio stations, TCP's, and highway regulation points to communicate with one another and with ports, depots, headquarters, and other areas.

(2) The fixed VHF radio stations enable radio-equipped vehicles, normally MP and some transportation or ordnance vehicles, to communicate with the nearest TCP and highway regulation point while moving or stopped. All such radio contact depends on the terrain, location of fixed and vehicular radio sets, and other factors affecting radio transmission.

(3) Besides radio and telephone communications between fixed and vehicular radio stations, telephone and teletypewriter circuits are provided by the open wire or radio-relay facilities between the fixed radio stations serving the TCP's and the highway regulation points.

(4) Signal units operate the fixed radio sta-

tions to provide maximum economy of equipment, radio frequencies, speed of service, and efficiency to the various services and units requiring communications along the military highway system. At each fixed radio station, signal personnel also operate a small switchboard, when required, with local telephone connections to the various adjacent services operating the TCP's and the highway regulation points. In some instances the fixed radio station will be located at or near a theater army signal switching center or a local signal center and will use its switchboard facilities.

e. Air Defense Communications Data.

(1) Air defense (AD) tactical success depends to a large extent on a reliable communications system. Precise track information on airborne targets and command and control data must be rapidly and accurately exchanged if AD is to accomplish its assigned tasks.

(2) AD units in a theater of operations are normally linked together with an electronic fire distribution system (missile monitor). The use of this fire distribution system demands the instantaneous exchange of automatic data link and voice information between various echelons of the air defense command (ADC).

(3) As presently established, the FACS does not possess the capability to provide AD units with a sufficient number of circuits to satisfy their needs. Future proposed increases in the traffic handling capability of the FACS may make its use in AD feasible.

(4) A VHF/UHF radio-relay system is established by signal detachments provided to AD units by attachment of appropriate personnel from TOE 11-500D. The equipment is basically the same as that used to establish the FACS and provides generally the same capabilities. VHF/UHF radio-relay facilities are established at each AD unit, using the missile monitor system and providing the following channels:

- (a) Automatic data link.
- (b) Command ("hot loop").
- (c) Intelligence and radar reporting.
- (d) Administrative and maintenance.

(5) If an electronic fire distribution system is not used, the necessary data are exchanged over communications nets established by radios organic to the AD units. If fire distribution system equipment is available, the TOE radios provide a backup means of communications.

3-7. Signal Pictorial Services

Division, corps, and field army use still and motion-picture ground photography, air still photography, and still-picture laboratory process-

Table 3-12. Pictorial Facilities of a Field Army

1	2	3	4	5	6	7	8
Unit	TOE	Ground cameras	Aerial cameras (acft)	Aerial cameras (drone)	Motion-picture cameras	Still-photographic laboratory	Motion-picture laboratory
2 Avn GS co, avn bn, inf div.....	1-78G	-----	X-----	X-----	-----	X-----	-----
3 Corps avn co.....	1-127D	-----	X-----	-----	-----	Svc from corps sig bn.	-----
4 Army avn co.....	1-137D	-----	X-----	-----	-----	Svc from fld army.	-----
5 Avn co, abn SF gp.....	1-307G	-----	X-----	-----	-----	X-----	-----
6 HHC, corps sig bn.....	11-16G	X-----	-----	-----	X-----	X-----	Svc from thtr.
7 Sig spt op co, sig bn, armd, inf, and inf (mech) div.....	11-39G	X-----	-----	-----	X-----	X-----	Svc from thtr.
8 HHC, army comd sig op bn.....	11-96G	X-----	-----	-----	X-----	X-----	Svc from thtr.
9 Sig co, abn SF gp.....	11-247G	X-----	-----	-----	X-----	X-----	Svc from thtr.
10 HHC, MI bn, air recon spt, fld army.....	30-6G	}	These units have special laboratory equipment for Army reproductions of Air Force air-photographs.				
11 MID, air recon spt, fld army.....	30-7G						
12 PSYOP teams.....	33-500G						
		X-----	-----	-----	X-----	X-----	-----

ing services. Facilities to provide these various services are available in differing degrees, commensurate with the pictorial requirements at these levels of command. Pictorial facilities at division are used extensively for intelligence gathering, historical records, administrative purposes, training, and information. However, each level of command is responsible for providing pictorial support to its subordinate units; when such support is for tactical purposes, requests from subordinate units get priority. In addition,

units from theater army may provide film and equipment and television services. Table 3-12 shows the pictorial facilities of a field army.

3-8. Characteristics of Communications-Electronics Equipment

Table 5-30 provides dimensions and weights. FM 24-19 lists the nomenclature, description, range, and appropriate remarks for each category of communications-electronics (COMMEL) equipment.

Section II. FIELD ENGINEERING

3-9. General

The data herein are for use as general guides. Their application will vary with local field conditions in each specific tactical situation, based on the recommendation, after reconnaissance, of the unit engineer charged with the task. FM 5-1 contains further detail on engineer operations in the field.

3-10. Roads and Bridges

a. Load Capacity of Civilian Bridges. Peacetime design includes high safety factors for unusual loads and deterioration. As a guide for military operations the assumption is that the ordinary civilian bridge in good condition will carry twice the rated civilian capacity when restrictions are placed on the speed and spacing of vehicles and on the number of lanes in use. However, an engineer officer should first analyze the bridge capacity.

b. Road Capacity. The capacity of the bridge usually limits the capacity of the road thereon.

c. Marking Bridges and Vehicles.

(1) Circular and rectangular signs mark bridges. Circular signs, by means of symbols and numerals, indicate the one-way capacity classification of a bridge, wheeled or tracked class or both, and the capacity classes of a two-lane bridge when used as either a double- or a single-lane bridge. Vertical arrows under two respective one-way and two-way class numbers mark the capacity of two-way bridges. When dual classification of bridges is to be posted, the wheeled and tracked classes are denoted by silhouette-type symbols together with the appropriate class numbers. When desired, rectangular signs located beneath the bridge class signs indicate any other information concerning the bridge, such as height or width limitations. Any bridge class that is a fraction of a whole number is *reduced* to the next lower whole number, e.g., 22.7 is reduced to 22. Figure 3-2 illustrates typical bridge markings.

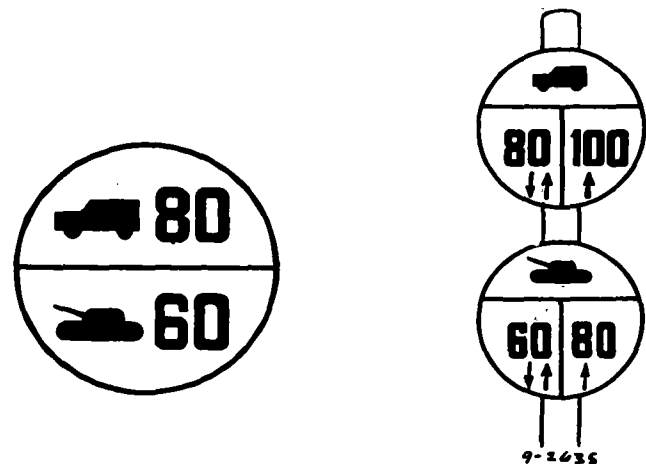


Figure 3-2. Typical bridge classification signs.

(2) Vehicles are marked with class numbers that represent their effect on the bridge when they cross it; the gross weight of the vehicle and the weight distribution determine the effect. Classification numbers are assigned to all single vehicles in military use having a gross weight in excess of 3 tons and to all trailers in military use having a rated payload in excess of $1\frac{1}{2}$ tons. All single vehicles in excess of 3-ton gross weight carry front class signs only; a side vehicle classification sign is placed on the right side of classified towing vehicles and trailers in excess of $1\frac{1}{2}$ tons. For combination vehicles, each leading vehicle in the combination carries a front vehicle classification sign inscribed with the classification number of the combination with the letter C in red above the classification number. Also, each vehicle in the combination carries a side vehicle classification sign inscribed with its classification as a single vehicle. When vehicles and the vehicles that they are towing are less than 30 meters apart and are on one bridge span at the same time, they are classed as combination vehicles. In these cases, the classification of the combination is the sum of

the classification numbers of the separate vehicles. This combination classification number is shown on a temporary front sign. Special-purpose vehicles are equipped with front classification signs or side classification signs, depending on their means of propulsion. FM 5-36 provides more detailed information.

d. *Engineer Road Construction.* Table 3-13 shows effective man-hours required for personnel of the engineer construction battalion (CB) to clear, grub, strip, and rough grade 1 mile of combat road, pioneer type.

Table 3-13. Road Construction (Man-Hours)

1	1	2	3
	Terrain	One-way (4.2m (14 ft))	Two-way (7.3m (24 ft))
2	Flat—prairie.....	1,500	2,200
3	Rolling.....	2,000	2,800
4	Hilly—forested.....	2,500	3,300

3-11. River- and Gap-Crossing Equipment

a. Table 3-14 shows the distribution of river- and gap-crossing equipment organic to divisional and nondivisional units. The infantry division engineer battalion is issued equipment listed either in column 3 or in column 4. The armored and infantry (mechanized) division engineer battalions are issued equipment listed either in column 5 or in column 6. If conventional bridging is issued, the unit is authorized either M4T6 (LIN C25072) or class-60 (LIN C25346) equipment but not both.

b. Table 3-15 lists the characteristics of assault boats. The load figures in the last column are based on the following assumed weights:

	Pounds
Rifleman with individual equipment.....	240
Small-arms ammunition, 1,000 rounds.....	85
Machinegun, caliber .30.....	49
Launcher, rocket.....	13
Launcher, ammunition, 1 round.....	9

c. Table 3-16 lists the characteristics of rafts. Data include the capacities of rafts in vehicle classification (FM 5-36) for various stream velocities and types of crossings. Velocities are given in both feet per second and meters per second. When two figures are given, the one to the left of the divider (/) pertains to wheeled vehicles and the one to the right pertains to tracked vehicles. Characteristics are based on loading rafts with center of gravity of loads 6 inches downstream from center line of raft and on properly inflated floats. Capacities for M4 and M4T6 bridging are based on roadway width of 18 balk, deck width of 22 balk, and an 18- or 19-foot end span.

d. Table 3-17 provides the load capacities of standard heavy floating bridges in vehicle classification

for various stream velocities and types of crossings. Characteristics are based on abutment-deck level without 10 inches of floating bridge-deck level except for hinges or other special end spans. When limitations are exceeded, capacities must be reduced. Bridges are reinforced by placing three floating supports under two bays of decking. Capacities for M4 and M4T6 bridging are based on roadway width of 18 balk and deck width of 22 balk. Reinforced assembly requires a 38-foot 4-inch superimposed end span. For class-60 reinforced bridges over streams with flow rates up to 9 feet per second, bridge capacities are controlled by end span limitations. When two figures are given, the one to the left of the divider (/) pertains to wheeled vehicles and the one to the right pertains to tracked vehicles.

e. Table 3-18 provides construction times for M4T6 and class-60 floating bridges. All bridges are constructed at prepared sites with no approach work. An overhead cable and bridge-line anchorage are constructed with each bridge. Hours shown are not working hours only, but straight-through hours because this is normal for bridge building. Estimated reinforcement times for 1,000-foot spans are feasible because this construction is normally a battalion-size job. The size of the maintenance crew depends greatly on the weather and stream conditions. The crew shown is the minimum troops for ideal conditions. The figures in the table are based on records of actual experiences. Examination of a time-versus-bridge-length graph will possibly explain some of the incongruities of the figures quoted.

f. Table 3-19 provides the vehicle classification capacities for fixed spans constructed from floating bridge components. In columns 3 through 17, the figure to the left of the divider (/) pertains to wheeled vehicles; the figure to the right pertains to tracked vehicles.

g. Table 3-20, based on information in TM 5-312, provides load capacity data for fixed highway bridges. In columns 2 through 22, the figure to the left of the divider (/) indicates the wheeled load class; the figure to the right indicates the tracked load class.

h. Table 3-21, based on information in TM 5-373, lists the characteristics of railway bridge equipment.

i. Table 3-22, based on information in TM 5-312, provides logistic and construction data for military fixed highway bridges. In line 5, columns 2 through 8, the figure to the left of the divider (/) indicates the number of 2½-ton dump trucks; the figure to the right indicates the number of 2½-ton utility pole trailers.

Table 3-14. Distribution of River- and Gap-Crossing Equipment

1		2		3		4		5		6		7		8		9	
1	Line item number	Item	Inf div engr bn (TOE 5-155G)		Armd and inf (mech) div engr bn (TOE 5-145G)		Abn div engr bn (TOE 5-25G)		Engr fitbrg co (TOE 5-78G)		Engr pnl brg co (TOE 5-77G)						
			MAB	Convl	MAB	Convl											
2	B83582	Bt, brg erection, inboard eng, aluminum, gas-driven, 27-ft long		8			8				10						
3	B83856	Bt, ldg, inflatable, aslt cft, nylon-cloth, 15-man	18	18		18	18				70						
4	B84404	Bt, recon, pneumatic, 3-man	28	28		32	32		11		10						
5	C20414	Brg, armd-veh-launched, scissor-type, cl 60, aluminum, 60-ft long	6	6		6	6										
6	C22058	Brg erection set, fxd-brg, highway, pony truss, ptbl, pnl-widened roadway, Bailey-type															1
7	C23017	Brg, fxd, highway, pony truss, ptbl, pnl-widened roadway, Bailey-type															1
8	C24935	Brg, fitg, ft									1						
9	C25072	Brg, fitg, highway, aluminum-deck, balk-superstructure		4			4				5						
10	C25346	Brg, fitg, highway, cl 60, 135-ft		4			4				5						
11	C25620	Brg, fitg, mbl, aslt, amph, 36-ft 1-in. long, 10-ft wide, 10-ft 4-in. high	16			16											
12	C25757	Brg, fitg, raft sec, lt, tac	2	2		2	2				6						
13	C26305	Brg erection set, fitbrg, cl 60, steel- or aluminum-deck, balk-superstructure		4			4				5						
14	H38787	Ferry conversion set, raft, inf spt	2	2		2	2				6						
15	L43664	Lchr, M60-series, tk chassis, trans 40- and 60-ft brg, type cl 60	4	4		4	4										
16	N34334	Outboard mtr, gas 25 bhp	8	8		8	8				24						
17	R11462	Ramp, loading, veh, mbl, aslt, amph, fitbrg, 39-ft 4-in. long by 10-ft wide by 11-ft high	8			8											

Table 3-15. Characteristics of Assault Boats

TABLE 3-10. Characteristics of Personnel Boats							
1	2	3		4	5	6	7
	Type of boat	Propulsion	Maximum stream velocity (fps)		Engineer crew	Troop capability	Total load including crew (STON)
			Make headway	Safely navigate			
2	Plastic aslt bt, 16-ft-----	Paddles-----	4	3	3	1 rifle sqd with organic wpns.	1.69
		25-hp outboard..	7	5	2	1 rifle sqd with organic wpns.	1.64
3	Pneumatic aslt bt (15 man)-----	Paddles-----	5	4	3	1 rifle sqd with organic wpns.	1.70
		25-hp outboard..	11	9	2	1 rifle sqd with organic wpns.	1.65

Table 3-16. Characteristics of Rafts

1	2	3	4	5	6	7	8	9	10	11	12	13	
1	Type of raft	Number of pons or floats	Overall length of raft m	Stream velocities for specified crossings (fps or mps)									
				Norm crossings					Risk crossings				
				0-5 fps 0-1.52 mps	7 fps 2.13 mps	8 fps 2.44 mps	9 fps 2.75 mps	11 fps 3.36 mps	5 fps 0-1.52 mps	7 fps 2.13 mps	8 fps 2.44 mps	9 fps 2.75 mps	11 fps 3.36 mps
2	Lt tac raft with artic- ulators.	4 pon 3 bay-----	17.7	12	12	12	8	0	14	14	14	12	4
		5 pon 5 bay-----	24.4	9	9	9	8	3	11	11	11	11	6
		6 pon 4 bay-----	21.0	13	13	13	13	6	15	15	15	15	10
3	M4-----	4 norm-----	26.5	50/55	50/55	50/55	50/55	40/45	55/60	55/60	55/60	55/60	45/50
		6 partially rinf---	26.5	70/75	70/75	65/70	65/70	50/55	75/80	75/80	75/80	75/80	55/60
		7 fully reinf-----	26.5	85/90	85/90	80/85	80/85	55/60	90/95	90/95	90/95	90/95	65/70
4	Cl 60-----	4 norm-----	28.1	40/45	40/45	35/40	35/40	25/30	50/55	50/55	45/50	45/50	35/40
		5 norm-----	32.8	50/55	50/55	45/50	40/45	30/35	60/65	60/65	55/60	50/55	40/45
		5 partially reinf--	28.1	55/60	50/55	50/55	45/50	35/40	60/70	60/65	60/65	55/60	45/50
		5 with 1 short deck bay reinf.	25.3	60/65	55/60	55/60	50/55	45/50	65/75	65/70	65/70	60/65	55/60
		6 fully reinf-----	28.1	65/75	65/75	60/70	60/65	50/55	80/90	80/90	75/80	70/80	60/70
5	M4T6-----	4 norm-----	26.5	50/55	45/50	40/45	35/40	35/40	60/65	55/60	50/55	45/50	35/40
		4 reinf-----	26.2	50/55	50/55	45/50	40/45	35/40	60/65	60/65	55/60	50/55	45/50
		5 norm-----	30.8	55/60	50/55	45/50	40/45	35/40	65/70	60/65	55/60	50/55	45/50
		5 reinf-----	27.1	60/65	60/65	55/60	55/56	45/50	70/75	70/75	65/70	65/70	55/56

Table 3-17. Characteristics of Standard Heavy Floating Bridges

Table 3-17. Characteristics of Standard Heavy Floating Bridges														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	
1	Type of bridge	Type of crossing	Stream velocities for specified assembly (fps or mps)											
			Norm						Reinf					
			3 fps 0.92 mps	5 fps 1.52 mps	7 fps 2.13 mps	8 fps 2.44 mps	9 fps 2.75 mps	11 fps 3.36 mps	3 fps 0.92 mps	5 fps 1.52 mps	7 fps 2.13 mps	8 fps 2.44 mps	9 fps 2.75 mps	11 fps 3.36 mps
		Norm	60	60	45/50	40/45	30/35	18/20	95	95	75/80	60/65	45/50	24/27
2	M4----	Caution	68	65	58/59	52/53	44/46	29/31	100	100	88/89	75/75	62	35/37
		Risk	72	68	61/62	58/59	53/54	37/39	105/110	105/110	101/105	88/89	74/75	45/46
		Norm	60/65	55/65	45/55	40/50	35/45	22/25	65	65	65	65	65	30/35
3	Cl 60---	Caution	65/70	62/67	56/61	52/56	45/49	34/37	75	75	75	75	75	47/51
		Risk	75/79	72/77	67/72	62/67	57/62	46/50	85	85	85	85	85	70/74
		Norm	50/55	45/55	40/50	35/45	30/40	25/30	75	75	70/75	65/70	55/60	27/30
4	M4T6--	Caution	60/61	58/59	54/55	49/51	45/57	35/37	80	80	79	73	66/67	43/45
		Risk	68/69	66/67	62/63	59/60	54/56	43/45	90	90	90	87	81	59/60

Table 3-18. Construction Times for Standard Heavy Floating Bridges*

1		2	3		4	5	6	7	8
1	Type of bridge	Type of construction	Approximate construction times (hr)				Construction party	Maintenance crew	
			Stream widths						
			150-ft	250-ft	500-ft	1,000-ft			
		Norm.....	2	3	5	50	1 fitbrg co plus 1 engr cbt co...	½ sqd up to 500 ft. 1 sqd more than 500 ft.	
2	M4T6.....	Reinf.....	3	4 ½	10	-----	1 fitbrg co plus 1 engr cbt co...	½ sqd up to 500 ft. 1 sqd more than 500 ft.	
		Norm.....	2 ½	3 ½	5	42	1 fitgrb co plus 1 engr cbt co...	½ sqd up to 500 ft. 1 sqd more than 500 ft.	
3	Cl 60.....	Reinf.....	3 ½	5	10	-----	1 fitbrg co plus 1 engr cbt co...	½ sqd up to 500 ft. 1 sqd more than 500 ft.	

*Does not include time necessary to clear site or do approach work.

Table 3-19. Load Capacities of Fixed Spans Constructed From Floating Bridge Components

a. Class-60 Bridge

1	Type of bridge	2 Type of crossing	3	4	5	6	7	8	9	10	11	12	13
			Capacities for specified clear span (ft)										
			24	26	28	30	32	34	36	38	40	50	60
2	Cl 60, fxd span cap---	Norm.....	100/120	95/120	80/115	65/105	60/95	55/85	50/75	45/65	40/60	30/30	20/22
		Caution.....	100/120	100/120	87/120	75/110	70/105	63/90	58/81	53/75	50/68	36/36	22/25
		Risk.....	100/120	100/120	100/120	90/120	85/120	75/110	68/100	65/90	60/83	45/50	28/30

b. M4T6 Bridge

1	Type of bridge	2 Type of crossing	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
			Capacities for specified span length and ratio of deck to roadway widths														
			23-ft 4-in. span		30-ft 0-in. span		38-ft 4-in. span				45-ft 0-in. span						
			22 18	22 18	22 16	24 18	22 18	22 16	24 18	26 18	20 16	22 18	22 16	24 18	24 16	26 18	26 16
2	M4T6 balk fxd span cap.	Norm.....	100/120	65/85	70/90	70/90	35/45	40/50	45/55	50/65	24/25	24/25	30/30	30/30	35/40	35/40	40/45
		Caution.....	100/120	80/100	80/100	85/105	51/70	51/70	55/75	50/82	35/40	40/46	40/46	43/51	43/51	46/56	46/56
		Risk.....	100/120	90/110	90/110	95/115	57/78	57/78	62/85	67/90	40/47	45/54	45/54	49/60	49/60	53/66	53/66

Table 3-20. Load Capacities of Fixed Highway Bridges

Table 6-10. Load Capacities of Rural Highway Bridges																						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
1	Panel bridges																					
	Bailey type, M2																					
	Single-single			Double-single			Triple-single			Double-double			Triple-double			Double-triple			Triple-triple			
	Norm	Cau- tion	Risk	Norm	Cau- tion	Risk	Norm	Cau- tion	Risk	Norm	Cau- tion	Risk	Norm	Cau- tion	Risk	Norm	Cau- tion	Risk	Norm	Cau- tion	Risk	
2	30	30/ 30	42/ 37	47/ 42																		
3	40	24/ 34	36/ 34	40/ 36																		
4	50	24/	33/ 31	36/ 35	75/ 70	83/ 86	88/ 84															
5	60	20/	30/ 29	33/ 32	65/ 65	77/ 73	85/ 79															
6	70	20/	24/	30/ 30	60/ 60	68/ 69	78/ 75															
7	80	16/	20/	24/	50/ 55	60/ 60	66/ 64	85/ 80	95/ 90	100/ 90												
8	90	12/	16/	19/	40/ 45	50/ 50	55/ 55	65/ 65	74/ 75	82/ 82												
9	100	8/	12/	14/	30/ 30	37/ 39	42/ 44	50/ 55	57/ 60	64/ 66	80/ 80	86/ 90	96/ 90									
10	110				20/	30/ 32	34/ 36	35/ 40	47/ 49	52/ 54	65/ 70	72/ 76	80/ 83	90/ 90	100/ 90	100/ 90						
11	120				16/	23/	27/ 30	30/ 35	36/ 41	43/ 45	45/ 55	57/ 61	64/ 68	75/ 80	83/ 90	91/ 90						
12	130				12/	18/	21/	20/	31/ 33	35/ 38	35/ 45	47/ 50	53/ 56	55/ 60	65/ 72	74/ 80	70/ 80	80/ 90	90/ 90			
13	140				8/	14/	17/	16/	24/	29/ 31	30/ 35	39/ 42	44/ 48	45/ 55	57/ 62	64/ 70	70/ 70	80/ 90	88/ 90			
14	150							12/	18/	22/	24/	32/ 35	36/ 40	35/ 45	47/ 51	54/ 58	60/ 60	77/ 85	85/ 90			
15	160							8/	15/	17/	16/	25/	30/ 33	30/ 35	37/ 41	45/ 48	55/ 55	69/ 78	80/ 89	80/ 75	100/ 90	100/ 90

Table 3-20. Continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Panel bridges																					
Bailey type, M2																					
1	Single-single			Double-single			Triple-single			Double-double			Triple-double			Double-triple			Triple-triple		
	Norm	Cau- tion	Risk	Norm	Cau- tion	Risk	Norm	Cau- tion	Risk	Norm	Cau- tion	Risk	Norm	Cau- tion	Risk	Norm	Cau- tion	Risk	Norm	Cau- tion	Risk
16	170						4/	10/	13/	12/	19/	24/	20/	31/ 34	36/ 40	45/ 50	57/ 64	64/ 74	70/ 70	80/ 90	90/ 90
17	180									8/	15/	18/	16/	24/	29/ 32	35/ 45	48/ 53	55/ 60	55/ 60	66/ 75	77/ 87
18	190												12/	18/	22/	30/ 35	39/ 43	46/ 51	45/ 55	59/ 66	68/ 77
19	200															20/	32/ 36	38/ 43	35/ 40	48/ 52	55/ 62
20	210															16/	25/	31/ 36	24/	38/ 43	46/ 51

Table 3-21. Characteristics of Railway Bridge Equipment

Table 5-21. Characteristics of Highway Bridge Equipment										
1	2	3	4	5	6	7	8	9	10	
1	Type of bridge	Bridge sets		Shipping data		Maximum speed at Cooper's E-45 loading (Mph)	Construction effort (man-hr)	Erection equipment		
		Procurement	Theater issue	Weight (STON)	Cubage (MTON)			Special sets	Components	Steel trestle units
	123-ft span		92-ft 3-in. span			40	No data avail.	Sp set for spans 92 ft 3 in. to 123 ft.	Lowering frames, erection derrick, misc equip, equip for sp methods.	T-type: piers 2 ft 8 in. in 1-ft 4-in. increments. For brg seatings, see TM 5-374.
			102-ft 6-in. span			40				
			112-ft 6-in. span			40				
			123-ft 0-in. span	133.66	131.00	40	No data avail. 9,000 11,294	Sp set for spans 133 ft 3 in. to 153 ft 9 in.		
			133-ft 3-in. span			40				
			143-ft 6-in. span			20				
			153-ft 9-in. span			10				
	2	Through truss	Set A (end posts from sloped to vertical).		1.68	0.50			Sp set consisting of erection frame and erection gantry.	
			Set B—(end posts from square to skew).	Set B	1.77	1.34				
			Set C—(connect 2 spans with sloped end posts).	Set C	0.18	0.14	NA	NA		
Set D—(connect 2 spans with vertical end posts).			Set D	0.27	0.20					
		Set K—(lengthen span to 153 ft 9 in.).	Set K	38.84	31.78					
3	Wide-flange beam.	27 in.	22-ft span (2 beams)	6.10	4.80		100	None.	No data avail.	Various.
			34-ft span (4 beams)	14.40	12.30	40	150			
			40-ft span (6 beams)	19.00	16.60		210			
		36 in.	35-ft span (2 beams)	12.40	10.50		170			
			45-ft span (4 beams)	28.40	24.70	40	470			
			57-ft span (6 beams)	39.90	35.00		540			
4	Plate girder, 48 in.	56-ft span (2 girders)	31.50	24.10		370	None.	No data avail.	Various.	
		80-ft span (4 girders)	66.90	51.80	40	660				
		100-ft span (6 girders)	117.50	88.60		1,200				

Table 3-22. Logistic and Construction Data for Military Fixed Highway Bridges

1		2	3	4	5	6	7	8	9	10	11	12	13	14
1	Item	Panel bridge, Bailey-type, M2							Beam bridges				Truss and girder bridges	
		Effective length of bay, 10 ft							I-beam stringers		WF-beam stringers		Truss	Girder
		Single truss single story	Double truss single story	Triple truss single story	Double truss double story	Triple truss double story	Double truss triple story	Triple truss triple story	30-ft span	60-ft span	27-in. depth	36-in. depth	90-ft span	48-in. depth
2	Weight per bay (STON).....	2.76	3.41	4.01	4.66	5.88	6.46	8.29	12.9	35.3	31.2	116.0	49.9	177.0
3	Cubage per bay (MTON).....	9.00	11.00	13.00	14.00	18.00	20.00	26.00	15.5	36.0	28.5	105.0	70.7	142.4
4	Type of issue (cl).....	II	II	II	II	II	II	II	IV	IV	IV	IV	IV	IV
5	Transportation per bay.....	3.40/ 1.0	2.20/ 0.70	2.60/ 0.70	3.00/ 0.70	3.80/ 0.90	3.70/ 0.80	5.50/ 0.90	No data aval.		No data aval.		No data aval.	
6	Man hours to erect 1 bay.....	58.00	37.00	49.00	63.00	98.00	161.00	281.00	No data aval.		No data aval.		No data aval.	

3-12. Field Fortifications

a. Priority of Work. The order in which the various defensive measures are to be performed is expressed as priorities. The assignment of priorities does not prevent simultaneous work on several tasks. After the location of combat emplacements has been fixed, the normal priority is —

- (1) Establishing security.
- (2) Positioning weapons.
- (3) Clearing fields of fire, removing objects, making observation, and determining ranges to probable target location.
- (4) Providing signal communications and observation systems.
- (5) Preparing weapon emplacements and individual positions, to include overhead cover, and camouflaging them concurrently.
- (6) Laying minefields and preparing important demolitions.
- (7) Preparing routes for movement and for supply and evacuation.
- (8) Preparing alternate positions.
- (9) Preparing obstacles (other than minefields) and less vital demolitions.
- (10) Preparing nuclear, biological, and chemical protective shelters as required.
- (11) Preparing deceptive installations in accordance with deception plans of higher headquarters.

b. Works. (The figures given in tables 3-23 through 3-26 are for daylight; for work at night, increase labor requirements by 50 percent.)

(1) *Personnel and weapon emplacements.* Table 3-23 lists the characteristics of personnel and individual weapon emplacements. Table 3-24 lists the characteristics of crew-served infantry and artillery weapon emplacements. Data in these tables are taken from FM 5-15, which should be used if greater detail is required.

(2) *Man-hour requirements.* Four man-hours' labor is required for clearing 100 square yards of brush and a few trees up to 12 inches in diameter; for clearing brush only, 2 man-hours labor is required.

(3) *Barbed wire obstacles.*

(a) In estimating material requirements, the minimum length of tactical wire entanglements for a defensive position is one and one-fourth times the frontage; minimum protective wire is five times the frontage. The length of tactical wire entanglements for a deliberate defense is five times the frontage; protective wire is six times the frontage.

(b) Table 3-25 lists the requirements for wire entanglement materials and is based on data in FM 5-34.

(c) Table 3-26 lists the materials required for constructing 275 meters of expedient concertina wire entanglement.

Table 3-23. Characteristics of Personnel and Individual Weapon Emplacements

Table 3-20. Characteristics of Personnel and Individual Weapon Emplacements																			
1		2	3	4		5	6	7	8	9	10	11	12	13	14	15	16	17	18
1		Type of emplacement or shelter	Fortification protection factor (NUC WPN)	Protection afforded		Total construction time in man-hours for construction with D-handle shovels and ordinary carpentry tools					Weight and volume of materials								
											Revetment materials for cover support only				Complete revetment				
				Thermal effects (NUC WPN)	Tracked vehicles	Artillery fragments	Revetment materials for cover support only		Complete revetment		No revetment materials used	Corrugated metal construction		Sized lumber construction		Corrugated metal construction		Sized lumber construction	
Corrugated metal construction	Sized lumber construction	Corrugated metal construction	Sized lumber construction				Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)		Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)				
2	Improved crater....	90	Fair.....	Virtually none	Better than in open.....	NA	NA	NA	NA	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	Skirmishers trench..	95	Fair.....	Virtually none	Better than in open.....	NA	NA	NA	NA	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
4	Prone emplacement..	85	Good.....	Virtually none	Fair.....	NA	NA	NA	NA	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
5	Open one-man foxhole.....	65	Very good.....	Good.....	Good.....	NA	NA	3.5	4.5	2.0	NA	NA	NA	NA	190	3.5	240	8	
6	Open one-man foxhole with offset....	20	Excellent.....	Very good.....	Excellent.....	9.0	14	10.0	16.0	NA	50	0.6	180	5.5	240	4.0	420	13	
7	One-man foxhole with half cover...	55	Very good.....	Fair (—).....	Very good.....	2.5	3	4.5	5.5	NA	10	0.1	20	0.6	200	3.5	260	8	
8	One-man foxhole with half cover and offset.....	20	Excellent.....	Very good.....	Excellent.....	10.0	14	12.0	18.0	NA	60	0.7	200	6.0	250	4.0	440	14	
9	Open two-man foxhole.....	65	Good.....	Good.....	Good.....	NA	NA	6.0	8.0	3.0	NA	NA	NA	NA	280	5.0	320	10	
10	Deepened two-man foxhole.....	55	Very good.....	Good.....	Very good.....	NA	NA	8.0	10.0	5.0	NA	NA	NA	NA	300	5.5	375	12	
11	Two-man foxhole with half cover...	60	Very good.....	Fair to good...	Very good.....	4.0	4	8.0	10.0	NA	15	0.2	32	1.0	280	5.0	350	11	
12	Two-man foxhole with half cover and two offsets....	15	Excellent.....	Very good.....	Excellent.....	20.0	30	22.0	35.0	NA	120	1.5	400	12.0	380	6.0	700	22	
13	Two-man foxhole with half cover and adjoining shelter.....	30	Excellent.....	Good.....	Excellent.....	11.0	17	13.0	22.0	NA	100	1.2	560	18.0	460	7.0	880	28	
14	Open fighting trench (25-ft long).....	85	Good.....	Fair.....	Fair.....	NA	NA	28.0	32.0	21.0	NA	NA	NA	NA	490	8.0	710	22	
15	Fighting trench with full cover (25-ft long).....	70	Excellent.....	Fair.....	Very good.....	27.0	29	35.0	40.0	NA	240	4.0	360	11.0	730	12.0	1,060	33	

Table 3-24. Characteristics of Crew-Served Infantry Weapon Emplacements

Table 3-24. Characteristics of Crew-Served Infantry Weapon Emplacements																		
1		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Type of emplacement or shelter	Fortification protection factor (NUC WPN)	Protection afforded			Total construction time in man-hours for construction with D-handle shovels and ordinary carpentry tools					Weight and volume of materials							
											Revetment materials for cover support only				Complete revetment			
			Revetment materials for cover support only		Complete revetment		No revetment materials used	Corrugated metal construction		Sized lumber construction		Corrugated metal construction		Sized lumber construction				
			Corrugated metal construction	Sized lumber construction	Corrugated metal construction	Sized lumber construction		Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)	Weight (lb)	Volume (cu ft)			
2	Open horseshoe-type M60 machinegun emplacements.....	70	Good.....	Fair.....	Fair to good...	NA	NA	5	7	2	NA	NA	NA	NA	280	5	450	14
3	Open 2 one-man foxhole-type light machinegun emplacement.....	65	Very good.....	Good.....	Good.....	NA	NA	6	7	4	NA	NA	NA	NA	530	10	640	20
4	Horseshoe-type machinegun emplacement with full cover.....	55	Very good.....	Fair.....	Very good.....	9	11	11	14	NA	190	4	250	7	720	13	890	27
5	2 one-man foxhole-type machinegun emplacement with ½ cover and adjoining shelter....	30	Excellent.....	Good.....	Excellent.....	15	22	19	28	NA	250	2.5	630	20	520	7.5	850	80
6	Pit-type emplacement for 3.5-in. rocket launcher....	80	Fair.....	Fair.....	Fair.....	NA	NA	5	6	3	NA	NA	NA	NA	110	1.0	160	5
7	81-mm mortar emplacement.....	85	Good.....	Virtually none	Fair.....	NA	NA	12	NA	NA	NA	NA	NA	NA	210	3.0	NA	NA
8	4.2-in. mortar emplacement.....	85	Good.....	Virtually none	Fair.....	NA	NA	29	NA	NA	NA	NA	NA	NA	370	6.0	NA	NA
9	Recoilless rifle position (mounted)...	80	Fair.....	Virtually none	Fair.....	NA	NA	NA	NA	30	NA	NA	NA	NA	NA	NA	NA	NA

Table 3-25. Wire Entanglement Material Requirements

1	2	3	4	5
Material	Approximate weight (kg)	Approximate length (m)	Number carried by one man	Approximate weight of man-load (kg)
2 Reel.....	47.5	366.0	½	24.0
3 Bobbin.....	3.5-4.0	27.5	4-6	14.5-24.5
4 Standard barbed-wire concertina.....	25.0	15.2	1	25.0
5 Expedient barbed-wire concertina.....	13.5	6.1	1	13.5
6 Screw pickets, long.....	4.0	1.6	4	16.3
7 medium.....	2.7	0.81	6	16.3
8 short.....	1.8	0.53	8	14.5
9 extra-long.....	7.25	2.4	3-4	21.8-29.0
10 U-shaped pickets, long.....	4.5	1.5	4	18.1
11 medium.....	2.7	0.81	6	16.3
12 short.....	1.8	0.61	8	14.5
13 extra-long.....	7.7-10.5	2.13	2	15.4-20.8
14 Wooden pickets, long.....	5.4-7.25	1.5	3	16.3-21.7
short.....	1.4-2.7	0.75	8	11.0-21.7

Table 3-26. Material Requirements for Construction of 275 Meters of Expedient Concertina Wire Entanglements

1	2	3	4
Type of concertina	Standard barbed wire (400-yd reels)	Number 10 wire (100-lb coils)	Number 16 wire (10-lb coils)
2 Double-belt.....	23	1	1
3 Triple-belt.....	34	1	1

3-13. Minefields

a. *General.* For detailed information on mine warfare, see FM 20-32.

b. *Standard landmines.* Table 3-27 provides data on standard landmines. (See also FM 5-34.)

c. *Minefield Estimates.* Table 3-28 may be used for initial estimates of material, transportation,

and labor requirements to emplace various minefields. The table is based on a standard pattern (three strips for protective, eight for defensive, and nine for barrier minefields). No safety factor for loss or damage to mines and fuzes in transport is included in the data. Normally, there is a 10-percent allowance for such loss.

d. *Minefield Clearance.* Table 3-29 may be used for initial estimates of time and material requirements for clearing or breaching minefields.

e. *Artificial Obstacle Requirements.* Table 3-30 may be used for initial estimates of types of material and manpower requirements for artificial obstacles.

Table 3-27. Standard Landmines

1	2	3	4	5	6
Line item number	Type	Unit weight (lb)	Number per container	Gross weight (lb)	Cubage (cu ft)
2 M45945	Apers, nm, M14.....	0.25	90	44	1.73
3 M46082	Apers, M16A1.....	8.0	4	45	0.77
4 M46493	Apers, M18A1.....	2.5	6	53	1.84
5 M47863	At, HE, hv, M15.....	31.0	1	49	1.17
6 M48000	At, HE, nm, hv, M19.....	28.0	2	71	1.57
7 M48137	At, HE, hv, M21.....	18.75	4	90	4.14
8 M48822	Cml, 1-gal.....	11.0	10	115	2.0
9 48959	Cml, 2-gal, M23.....	22.75	3	115	3.8

Table 3-28. Manpower, Material, and Transportation Requirements for Emplacement of Minefields

	1	2	3	4	5	6	7
		Units per 1,000 meters of minefield			Nuisance mining		
1	Item	Protective ^a	Defensive 1-4-8 ^b	Barrier 3-4-8 ^b	Harassing per kilometer ^b	Facility denial per facility	Route mining per kilometer
2	Antitank mines.....	500.0	1,632.0	4,564.0	4.0	12.0	30.0
3	Metallic (M15).....	(125.0)	(^c 1,306.0)	(^c 3,651.0)	-----	-----	-----
4	Nonmetallic (M91).....	-----	(326.0)	(913.0)	(1.0)	(^b)	(^d)
5	Mine, shaped-charge (M21).....	(375.0)	-----	-----	(3.0)	(10.0)	(25.0)
Antipersonnel mines:							
6	Blast (M14 or M25).....	1,000.0	12,601.0	12,601.0	15.0	30.0	175.0
7	Fragmentation (M16A1).....	-----	6,194.0	6,194.0	25.0	50.0	325.0
8	Directional (M18A1).....	1,000.0	-----	-----	5.0	10.0	20.0
9	Firing devices.....	-----	^e 164.0	^d 1,460.0	^f 2.0	^f 4.0	^f 10.0-
10	Trip flares (M49).....	100.0	100.0	100.0	-----	-----	-----
11	Barbed wire (400-yd reel) ^a	-----	10.6	11.6	-----	-----	-----
12	Pickets, long.....	-----	140.0	150.0	-----	-----	-----
Manpower ^b :							
13	Man-hours.....	370.0	2,420.0	3,213.0	8.0	16.0	71.0
14	Platoon hours (30 men).....	12.3	80.7	107.1	0.27	0.57	2.37
15	Company-days (3 plat, 10 hr per day).....	0.4	2.7	3.6	0.009	0.018	0.08
Tonnages:							
16	Short tons.....	10.83	74.27	142.37	0.42	0.87	2.296
17	Measurement tons.....	16.43	81.44	161.86	0.23	0.53	2.340
Trucks required:							
18	2 ½-ton (M35)—4 tons or 407 cu ft.....	2.7	18.6	35.6	0.1	0.2	0.6
19	5-ton (M54)—6 tons or 513 cu ft.....	1.8	12.4	23.7	0.07	0.15	0.38
20	5-ton (M51)—7 ½ tons or 135 cu ft.....	4.9	24.2	48.0	0.07	0.15	0.7

^a No irregular outer edge (IOE) in protective field.^b IOE cluster composition for defensive and barrier minefields is 1-2-2.^c Reduce number of mines in defensive and barrier minefields 50 percent when using M21 mines in place of M15 mines.^d 20 percent of M15 and M19 boobytrapped with 2 devices.^e 5 percent of M15 and M19 boobytrapped with 2 devices.^f 100 percent of M19 boobytrapped with 2 devices. M21 cannot be boobytrapped with devices.^a sides and rear of minefield only.^b Based on laying rate of 4 antitank, 8 antipersonnel fragmentation, or 16 antipersonnel blast mines per man-hour.

Table 3-29. Minefield Clearance (Average Time and Material Requirements)

TABLE 107. Minefield Clearance (Average Lane and Practical Requirements)				
	1	2	3	4
1	Method	Width of cleared lane (m (yd))	Man-hours required per 91.44 meters (100 yd)	Remarks
	<i>Manual</i>			
2	Location by probing.....	0.914 (1.0) (footpath).	15.0-20.0.....	See note.
3	Removal by rope or explosives.....	3.657 (4.0) (vehicle lane).	35.0-40.0.....	See note.
4	Location by detector, assisted by probing.....	22.86 (25.0)..... 3.657 (4.0) (vehicle lane).	200.0-225.0..... 25.0-30.0.	See note.
	<i>Explosives</i>			
5	Demolition snake, M3A1.....	2.74-3.65 (3.0- 4.0).	0.75.....	Employment time only. 90-100 hours required for assembly of M3A1.
6	Cable, antipersonnel, M1.....	0.914 (1.0) (footpath).	3.0-4.0.....	Cable, antipersonnel, M1, is not effective against antitank mines.
7	Bangalore torpedo.....	0.914 (1.0) (footpath).	3.0-4.0.....	See note.

Note. Based on average conditions of visibility and moderate enemy activity and normal U.S. countermeasures, i.e. screening of enemy observation and counter-battery fires against hostile artillery or other weapons covering the field.

Table 3-30. Average Requirements for Artificial Obstacles (400 Square Kilometers)

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Item and unit	Defensive operations				Retrograde operations				Offensive operations			
		Easy movement	Moderate movement	Difficult movement	Very difficult movement	Easy movement	Moderate movement	Difficult movement	Very difficult movement	Easy movement	Moderate movement	Difficult movement	Very difficult movement
Minefields													
2	Barrier (km)-----	10.3	7.8	2.6	2.6	1.0	0.8	0.5	0.3	0.3	0.2	0.1	0.1
3	Defensive (km)-----	5.2	4.0	2.5	1.3	0.4	0.3	0.1	0.1	0.2	0.1	0.1	0.1
4	Protective (km)-----	0.3	0.2	0.1	0.1	0.5	0.4	0.3	0.1	0.5	0.4	0.3	0.1
Nuisance mining													
5	Harassing (sq km)---	70.0	55.0	35.0	20.0	250.0	180.0	150.0	75.0	-----	-----	-----	-----
6	Facility denial (each)	70.0	85.0	100.0	100.0	55.0	65.0	65.0	65.0	7.0	7.0	6.0	6.0
7	Route mining (km)---	45.0	35.0	25.0	12.0	115.0	100.0	70.0	45.0	-----	-----	-----	-----
Obstacles													
8	Highway bridges (each)-----	40.0	35.0	30.0	15.0	35.0	30.0	20.0	15.0	4.0	4.0	3.0	2.0
9	Railroad bridges (each)-----	3.0	3.0	3.0	2.0	3.0	3.0	3.0	2.0	-----	-----	-----	-----
10	Tunnels (each)-----	-----	-----	-----	1.0	-----	-----	-----	1.0	-----	-----	-----	-----
11	Swamps (each)-----	7.0	15.0	25.0	30.0	6.0	8.0	12.0	14.0	1.0	1.0	1.0	1.0
12	Road craters (each)---	75.0	68.0	68.0	66.0	28.0	28.0	30.0	36.0	1.0	1.0	1.0	2.0
Barbed-wire entanglements													
13	Double apron 4/2 pace (km)-----	25.0	25.0	25.0	25.0	2.5	2.5	2.5	2.5	-----	-----	-----	-----
14	4-strand protective (km)-----	10.0	10.0	10.0	10.0	1.0	1.0	1.0	1.0	-----	-----	-----	-----
15	Triple concertina (km)-----	6.5	6.5	6.5	6.5	0.5	0.5	0.5	0.5	-----	-----	-----	-----
Material													
16	Antitank mines (each)-----	58,117.0	44,478.0	29,953.0	15,678.0	10,577.0	8,841.0	6,075.0	4,012.0	2,030.0	1,360.0	842.0	742.0
Antipersonnel mines:													
17	Fragmentation (each)-----	118,132.0	93,914.0	63,469.0	34,996.0	59,647.0	51,013.0	36,567.0	25,253.0	4,017.0	2,679.0	1,900.0	1,700.0
18	Blast (each)-----	198,270.0	153,820.0	100,874.0	52,538.0	42,911.0	37,024.0	23,987.0	17,078.0	6,741.0	4,228.0	2,892.0	2,692.0
19	Firing devices, assorted (each)---	16,761.0	12,844.0	8,722.0	4,569.0	3,396.0	2,837.0	2,007.0	1,315.0	499.0	337.0	187.0	187.0
20	Trip flares-----	3,655.0	3,275.0	2,855.0	2,475.0	400.0	358.0	300.0	258.0	100.0	70.0	30.0	30.0
21	Explosives (total) (lb)-----	99,000.0	93,800.0	93,800.0	88,600.0	65,300.0	60,300.0	54,500.0	52,600.0	5,100.0	5,100.0	4,100.0	3,100.0
22	Barbed wire (400-yd reels)---	1,214.6	1,172.9	1,126.8	1,084.0	120.0	110.0	110.0	108.7	5.6	3.4	2.3	2.3
23	Concertina coils (each)-----	1,281.0	1,281.0	1,281.0	1,281.0	98.6	98.6	98.6	98.6	-----	-----	-----	-----
24	Short tons-----	2,291.2	1,820.4	1,324.8	826.0	655.3	559.7	415.6	301.4	72.5	49.7	32.9	30.0
25	Measurement tons---	2,473.7	1,948.0	1,383.2	827.8	610.1	519.3	372.3	265.5	79.6	53.6	34.7	30.8

Table 3-30--Continued

1	Item and unit	2	3	4	5	6	7	8	9	10	11	12	13
		Defensive operations				Retrograde operations				Offensive operations			
		Easy movement	Moderate movement	Difficult movement	Very difficult movement	Easy movement	Moderate movement	Difficult movement	Very difficult movement	Easy movement	Moderate movement	Difficult movement	Very difficult movement
<i>Manpower</i>													
26	Platoon-hours (30 men)-----	1,981.1	1,600.0	1,174.0	753.5	596.6	512.6	382.6	281.9	63.0	43.0	29.8	27.2
27	Battalion-days (10-hr day, 4 co, 3 plat each)-----	16.5	13.3	9.8	6.3	5.0	4.3	3.6	2.3	0.5	0.4	0.3	0.2

Note 1. Terrain types having following characteristics:

a. *Movement*

- (1) *Easy*. Rolling or level, mostly open, trafficable land. (No one obstacle or combination of obstacles comprises more than 25 percent of the area.)
- (2) *Moderate*. Low hills, scattered forest, poorly drained land. (Any one type of obstacle or combination of obstacles comprises 25 to 50 percent of the area.)
- (3) *Difficult*. High hills, broken forests, poorly drained land. (Any one type of obstacle or combination of obstacles comprises 50 to 75 percent of the area.)
- (4) *Very difficult*. Mountains, forests, marshes. (Any one type of obstacle or combination of obstacles comprises 75 percent of the area.)

b. *Obstacles*

- (1) Hills and mountains—steep slopes and rough terrain.
- (2) Forests—dense woods with trees that are large enough to stop tanks.
- (3) Marsh—wet, swampy, untrafficable ground.

Note 2. Does not include tactical wire.

3-14. Demolition

a. Explosive requirements for various demolition tasks vary widely, depending on the size of the structure, type of construction, type of materials in the structure, age, location, necessary safety precautions, and other factors.

b. Table 3-31 may be used for initial estimates of material and manpower requirements for the more common types of demolition tasks required in creating obstacles. (See also FM 5-25.)

c. FM 101-10-3 contains classified data.

Table 3-31. Material and Manpower Requirements for Individual Barrier Targets

1	2	3	4	5	6	7
Target	C-4 (lb)	TNT (lb)	Cratering charge (40-lb)	Shaped charge (40-lb)	Thermite grenades (each)	Squad-hours (10 men)
<i>Highways</i>						
2 Major bridge (more than 400 ft).....		1,200				3.0
3 Minor bridge (up to 400 ft).....		800				2.0
4 Tunnel.....		12,000				5.0
5 Road crater.....		500	102			12.0
<i>Railroads</i>						
Major bridge (more than 400 ft):						
6 Single track.....		3,000				6.0
7 Double track.....		4,500				6.0
Minor bridge (up to 400 ft):						
8 Single track.....		2,000				4.0
9 Double track.....		3,000				4.0
10 Tunnel.....		12,000				5.0
11 Terminal facilities.....	542	30			43	3.2
12 Rolling stock (locomotive and 30 cars).....	6				121	3.2
<i>Airfields</i>						
13 Runway (per 1,000 ft).....		5,500		25		8.0
Fuel storage (per tk):						
14 Below ground.....		400			1	1.0
15 Above ground.....				1	1	0.2
16 Radar/radio apparatus.....		30			10	0.4
<i>POL facilities</i>						
17 Storage and handling.....	4		15		10	1.2
18 Refining facilities.....	80				15	0.8
19 Distribution.....	10				2	0.2
<i>Electric power denial</i>						
20 Generator.....		150			10	1.0
21 Transformer station.....		100			25	1.0
<i>Telecommunications denial</i>						
22 Telegraph exchange.....	10				1	0.1
23 Telephone exchange.....	20				2	0.2
24 Repeater/radio station.....	40				2	0.2
25 Radio station.....	40					0.2
26 Radio link terminal.....	40					0.2
<i>Waterways denial</i>						
27 Lock.....	110					0.6
28 Weir.....		1,000				2.0
29 Levee wall, aqueduct, or siphon.....			15			2.0
30 Dam (navigation).....	500					2.5
31 Inland port facilities.....	20	20				0.4

3-15. Ford Trafficability

Data in table 3-32 are based on a moderate current (not more than 1.5 meters per second), hard bottom, and hard, dry approaches. Suitable water-proofing may materially increase fording depths of vehicles. For streams of high current velocity, the attitude of the tank (lines 4 and 5 in the table) to the current and the length of time that the tank is exposed to the current have an appreciable effect on the depth that the tank can ford.

Table 3-32. Fording Data

1	2	3	4
Type of traffic	Fordsble depth (m (ft))	Minimum width (m (ft))	Maximum desirable slope for approaches (percentage)
2 Ft.....	1.0 (3.3)..	1.0 (3.3) (single file). 2.0 (6.6) (column of 3's).	100
3 Trks and trkdr arty.	0.6 (2.0)..	3.7 (12.0)....	33
4 Lt tks.....	1.0 (3.3)..	4.3 (14.0)....	50
5 Mdm tks*....	1.2 (4.0)..	4.3 (14.0)....	50

*Depths up to 4.3 meters (14.1 ft) can be negotiated with deep-water fording kit.

Four feet is the design fording depth of modern U.S. tanks. Experience indicates that tanks can ford slightly greater depths for short distances without stalling.

3-16. Load-Bearing Capacity of Ice

The strength of ice varies with the structure of the ice, the purity of the water from which it forms, the cycle of formation (freezing, thawing, and refreezing), temperature, snow cover, and water currents. Tables 3-33 and 3-34 are based on the characteristics of good quality waterborne ice. They may be used as guides until actual load tests are made to determine the load-bearing capacity of the ice.

Table 3-33. Ice Load-Carrying Capacity for Sleds

1	2
Ice thickness (cm (in))	Gross sled weight (tons)
2 15.0 (6.0).....	1
3 17.5 (7.0).....	2
4 23.0 (9.0).....	5
5 33.0 (13.0).....	10
6 40.0 (16.0).....	15
7 46.0 (18.0).....	20

Table 3-34. Ice Load-Carrying Capacity for Personnel and Equipment

1	2	3	4
Type of load	Gross weight (tons)	Minimum ice thickness (cm (in))	Minimum distance between loads (m (yd))
2 Soldier on skis or snowshoes.....	0.1	3.0 (1.2)	5.0 (5.5)
3 Soldier on foot.....	0.1	5.0 (2.0)	5.0 (5.5)
4 Infantry (colm of 2's).....		7.6 (3.0)	7.3 (8.0)
5 Infantry (colm of 4's).....		10.0 (4.0)	10.0 (11.0)
6 Wheeled-vehicle loads up to.....	3.5	23.0 (9.0)	15.0 (16.5)
7 Wheeled-vehicle loads up to.....	6.0	30.0 (12.0)	20.0 (22.0)
8 Wheeled-vehicle loads up to.....	10.0	40.0 (16.0)	25.6 (28.0)
9 Wheeled-vehicle loads up to.....	15.0	61.0 (24.0)	30.0 (33.0)
10 Tracked-vehicle loads up to.....	3.5	20.0 (8.0)	15.0 (16.5)
11 Tracked-vehicle loads up to.....	10.0	30.0 (12.0)	20.0 (22.0)
12 Tracked-vehicle loads up to.....	12.5	40.0 (16.0)	25.6 (28.0)
13 Tracked-vehicle loads up to.....	25.0	61.0 (24.0)	40.0 (44.0)
14 Tracked-vehicle loads up to.....	45.0	71.0 (28.0)	50.0 (55.0)
15 Tracked-vehicle loads up to.....	60.0	81.0 (32.0)	60.0 (66.0)



CHAPTER 4

COMBAT SERVICE SUPPORT—PERSONNEL AND CIVIL AFFAIRS

Section I. INTRODUCTION

4-1. General

This chapter covers that function of combat service support in the field army concerned with personnel and civil affairs. The general principles of combat service support are summarized in the first paragraph of chapter 5 because these principles are better described in relation to the supply function. For convenience to the user, this procedure of relating similar subjects is followed throughout the combat service support chapters (e.g., legal services are included with personal services).

4-2. Outline

a. Section II provides the staff officers information to estimate losses and the requirements for replacements in —

(1) Combat zone forces of division or larger, both for short periods of a particular type of combat action and for longer periods of a variety of types of action.

(2) Forces in the communications zone (COMMZ).

(3) Forces in theaters of operation.

Two methods of varying accuracy are given. In each case, loss estimates are given for the unit concerned as a whole with breakdowns by branch of service. FM 101-10-3 contains classified data pertaining to estimation of losses and requirements for replacements in a theater of operations where the enemy employs nuclear weapons.

b. Evacuation and hospitalization in the field army is described in paragraphs 4-9 through 4-24.

c. Paragraphs 4-25 through 4-31 provide a basis for estimates of prisoners of war and civilian and military internees by listing crime rates and experience data under varying conditions of World War II.

d. A basis for estimates of decorations and mail by giving experience data from World War II and the Korean War is given in paragraphs 4-32 through 4-35.

e. Civil affairs matters are discussed in paragraphs 4-36 and 4-37.

Section II. LOSSES AND REPLACEMENTS

4-3. Loss

A personnel loss is any reduction in the assigned strength of a unit. A loss is caused primarily by enemy action, disease, accidents, and administrative action. The rate of loss varies with the theater of operations, climate, terrain, the condition and state of training of troops, type of activity, the enemy, and numerous other factors. Each division and corps has its own loss experience dependent on its own situation. Loss rates by arm or service and by military occupational specialty within corps and division vary with the exposure of the particular category of personnel to the various causes of losses.

a. *Categories of Losses.* Personnel losses are recorded in three general categories:

(1) *Battle*, which are those losses incurred in action, including —

(a) Wounded or injured in action to include those who died of wounds and died of injuries received in action.

(b) Killed in action.

(c) Missing in action or captured by the enemy.

(2) *Nonbattle*, which are those losses not directly attributable to being in action, regardless of when sustained, including —

(a) Nonbattle dead.

(b) Nonbattle accident/injury.

(c) Nonbattle missing.

(d) Sick/disease.

(3) *Administrative*, which are those losses including —

(a) Transfers from the unit.

(b) Absent without leave.

(c) Desertion.

(d) Rotation of personnel.

(e) Discharges.

b. *Gross Losses.* In addition to those killed, captured, or missing, gross losses include personnel evacuated to hospitals and dropped from the rolls of their units. In all units within the theater army, any man hospitalized or evacuated to a hospital is dropped from unit rolls and carried on the rolls of theater training, transient, and patient (TT&P) strength, which is not chargeable against the authorized theater strength.

c. Net Losses. Net losses are gross losses less personnel returned to duty within the theater. Net losses are computed only at theater level and are used as a basis for estimates of personnel required from the continental United States (CONUS) to maintain theater strength.

d. Loss Experience.

(1) Factors and figures that appear in the tables of this section are based primarily on World War II and Korean War experience and will not necessarily apply during another war. For planning, loss experience of past wars is modified by evaluating new factors applicable to new conditions. As a war progresses, every echelon of command gradually builds up loss experience that more accurately reflects the current conditions. Even the most complete and accurate figures relating to past wars cannot be relied on as valid for any future war. With experience as a basis, good judgment and sound knowledge of principles are used to develop new experience tables applicable to new conditions. Administrative losses are based on changing policies and, except for the confinement rates for military prisoners, are not adaptable to the establishment of loss tables based on experience. Therefore, experience tables for administrative losses, other than confinement, are not included in this manual. Paragraphs 4-25 through 4-32 contain experience tables for losses to confinement.

(2) Since the disease rate is a large part of the nonbattle loss rate, the overall loss rate has seasonal variations and depends on the region where the force is operating. In general, disease losses can be expected to exceed battle losses over an extended period by a magnitude of as much as three to one. On occasions the ratio may reach six to one or greater. Generally, the majority of disease cases are not hospital admissions and, therefore, do not contribute to statistics. However, these disease losses do represent a form of non-effectiveness since they can markedly decrease the ability of an individual or a unit to perform a mission.

4-4. Nuclear Loss Estimates

a. General. The enemy's use of nuclear weapons against U.S. forces results in increased battle losses. Battle losses from nuclear weapons may be divided into two general categories:

(1) Battle losses sustained when a military unit is destroyed. Such losses are so great that individual replacement is not feasible. Replacements for these battle losses are provided for by unit replacement.

(2) Battle losses sustained when units are

on the periphery of the area of damage. Replacements for battle losses in this category come from survivors of destroyed units and from personnel in the individual replacement system.

b. Factors Influencing Losses. No valid experience data exist from which loss experience tables can be compiled. The problem of estimating the number of replacements (both unit and individual) required to replace losses to nuclear weapons involves many variable factors. Among the more important of these factors are —

(1) Frequency of enemy employment of nuclear weapons.

(2) Types and yields of weapons employed.

(3) Types of targets selected for nuclear weapon attack.

(4) Effectiveness of enemy target location system.

(5) Accuracy of enemy delivery means.

(6) Protective measures adopted by own forces.

c. Effect of Nuclear Attack. Nuclear attack on CONUS with the attendant damage, contamination, and fallout introduces new elements that will affect the magnitude of disease and nonbattle injury rates among survivors. A preliminary gross estimate that may be used in planning for nuclear warfare indicates that a multiplying factor of 2.8 is applied to the nonbattle admission rate as shown for CONUS.

d. Estimation of Battle Losses. Effective battle loss estimation requires an aggressive effort on the part of all agencies, particularly intelligence agencies, to provide specific data to eliminate the variable factors outlined in *b* above or to permit reasonable assumptions concerning these variable factors. The validity of battle loss estimation is directly proportional to the degree of refinement that can be made in these factors. FM 101-10-3 contains classified information pertaining to nuclear battle losses under conditions of nuclear warfare.

4-5. Unit Replacements

Each theater army is authorized separate units to employ as replacements for units that may become ineffective. The Department of the Army determines the numbers and types of units furnished, based on the recommendations of the theater commander.

4-6. Combat Zone Estimates

a. General. The procedures and data herein apply to the estimation of nonnuclear losses. Because of the possible nuclear battle losses and the effect that such losses may have on tactical opera-

tions, nuclear battle losses are estimated separately. (See FM 101-10-3.)

b. Purpose of Estimate. Personnel loss estimates at corps and division are used to anticipate the effect of losses on the tactical plan for the handling of replacements within the commands. The estimates have to answer three questions: the strength at any given time, the losses anticipated for a specific situation, and the distribution of these losses by arm or service and military occupational specialty. Combat estimates are of two types: short-period (5 days or less) and long-period (more than 5 days). Estimates at field army are used for the same purposes as at corps and division. In addition, they are used as a basis for allocation of available replacements and to inform higher headquarters of anticipated replacement requirements. Field army and corps headquarters use both short-period estimates and long-period estimates. Divisions normally use only short-period estimates.

c. Factors. In calculating losses, there are two major factors to consider:

(1) Loss rates applicable to the specific situations are expressed as percentage of strength or as number per thousand of average strength of any given period. In compilation and use of loss data, units whose loss rates are about the same because of similar operating conditions are grouped together.

(2) Loss rates are applied to the strength of the particular command under consideration. Two different strengths are used:

(a) *Authorized strength* is table of organization and equipment (TOE) strength plus additional personnel authorized by higher headquarters. Authorized strength is used in long-range planning and in cases of unknown or rapidly fluctuating assigned strength.

(b) *Assigned strength* includes all personnel carried as assigned on the unit's roster. Assigned strength is used, when known, in long-period estimates if it differs materially from authorized strength and if it will remain reasonably stable during the estimated period.

d. Short-Period Estimates (Periods Not in Excess of 5 Days).

(1) *General.* Tables 4-1 and 4-2 provide percentages by type of action and by combat arm or branch. Table 4-1 is not used for loss estimates for a period greater than 5 days.

Table 4-2. Distribution of Battle Losses by Branch
(Divisions)

1	Branch	2	3	4
		Infantry division (percentage)	Armored division (percentage)	Airborne division (percentage)
2	Infantry.....	93.0	62.0	85.6
3	Artillery.....	2.4	3.6	6.9
4	Armor.....	2.0	23.1	0.0
5	Engineers.....	1.5	3.3	3.9
6	All others.....	1.1	8.0	3.6

(2) *Distribution of infantry losses by selected military occupational specialty within an infantry division.* Personnel losses of maneuver battalions most seriously affect the combat effectiveness of an infantry division. A total of 87.4

Table 4-1. Daily Personnel Losses as Percentage of Strength

1	General type of operations for the force as a whole	2			5			8		
		Division in contact			Divisions in corps and field army reserve			Nondivisional units, corps, and field army ¹		
		Battle loss (per- centage)	Nonbattle loss (per- centage)	Total per- centage	Battle loss (per- centage)	Nonbattle loss (per- centage)	Total per- centage	Battle loss (per- centage)	Nonbattle loss (per- centage)	Total per- centage
2	Covering and security force action.....	0.9	0.3	1.2	0.3	0.3	0.6	0.3	0.1	0.4
	Attack:									
3	Meeting engagement.....	2.4	0.3	2.7	0.3	0.3	0.6	0.4	0.1	0.5
4	Of a position—1st day....	3.8	0.3	4.1	0.4	0.3	0.7	0.5	0.1	0.6
5	Succeeding days.....	1.9	0.3	2.2	0.3	0.3	0.6	0.4	0.1	0.5
6	Of a fortified zone—1st day	6.3	0.3	6.6	0.5	0.3	0.8	0.7	0.1	0.8
7	Succeeding days.....	3.2	0.3	3.5	0.4	0.3	0.7	0.5	0.1	0.6
	Defense:									
8	Meeting engagement.....	1.5	0.3	1.8	0.3	0.3	0.6	0.3	0.1	0.4
9	Of a position—1st day....	1.9	0.3	2.2	0.3	0.3	0.6	0.4	0.1	0.5
10	Succeeding days.....	1.0	0.3	1.3	0.3	0.3	0.6	0.3	0.1	0.4
11	Of a sector—1st day.....	3.2	0.3	3.5	0.4	0.3	0.7	0.5	0.1	0.6
12	Succeeding days.....	1.6	0.3	1.9	0.3	0.3	0.6	0.4	0.1	0.5
13	Inactive situations ²	0.7	0.3	1.0	0.3	0.3	0.6	0.3	0.1	0.4
14	Pursuit.....	1.3	0.3	1.6	0.3	0.3	0.6	0.3	0.1	0.4
15	Retirement and delayed action	0.7	0.3	1.0	0.3	0.3	0.6	0.3	0.1	0.4

¹ Use divisional loss rates for units attached to a division.

² Forces in contact—neither side attacking.

percent of the infantry battle losses occurs among riflemen and weapon crewmen (and closely allied specialists), who constitute the larger portion of the infantry division assault battalion's strength. In stability operations, maneuver battalions may experience a substantial increase in the loss rate among noncommissioned officers.

(3) *Distribution of nonbattle losses.* Nonbattle losses in each branch are in the same proportion to the total nonbattle losses as the strength of that branch is to the total strength of the unit.

(4) *Example.* Calculate the total nonnuclear losses of a type infantry division in the first 3 days of the defense of a position and determine the number of infantry riflemen and weapon crewmen who become battle losses.

(a) *Total losses.*

Authorized strength of division.....	17,423
Assigned strength of division (assumed), beginning of first day.....	15,341
Losses, first day, defense of position (2.2 percent $\times$ 15,341—table 4-1, line 9, colm 4).....	338
Assigned strength, end of first day.....	15,003
Losses, second day, defense of position (1.3 percent $\times$ 15,003—table 4-1, line 10, colm 4).....	195
Assigned strength, end of third day.....	14,808
Losses, third day, defense of position (1.3 percent $\times$ 14,808—table 4-1, line 10, colm 4).....	193
Assigned strength, end of third day.....	14,615
Total losses, 3 days (338 + 195 + 193).....	726

(b) *Battle losses.*

First day, defense of position (1.9 percent $\times$ 15,341—table 4-1, line 9, colm 2).....	291
Second day, defense of position (1 percent $\times$ 15,050—table 4-1, line 10, colm 2).....	150
Third day, defense of position (1.0 percent $\times$ 14,900—table 4-1, line 10, colm 2).....	149
Total battle losses.....	590

(c) *Infantry battle losses.*

Infantry battle losses (93 percent $\times$ 590—table 4-2, line 2, colm 2).....	549
Infantry riflemen and weapon crewmen battle losses (87.4 percent $\times$ 549—(4-6d(2)).....	480

e. *Long-Period Estimates—Combat Zone (Periods in Excess of 5 Days).*

(1) *Monthly personnel losses.* Tables 4-3 and 4-4 provide percentages of personnel losses for World War II and the Korean War respectively.

Table 4-3. Personnel Losses
(World War II) (All Theaters)

1	Troops	2	3
		Battle losses percentage per month	Nonbattle losses percentage per month
2	Infantry divisions in combat zone.....	10.00	8
3	Armored divisions in combat zone.....	8.00	7
4	Infantry divisions (mecha- nized) in combat zone....	8.15	8
5	Corps and field army non- divisional troops in combat zone.....	1.25	3

(2) *Types of battle losses as percentage of total battle losses.* Table 4-5 contains percentages for types of battle losses. Table 4-6 contains percentages for losses by branch within corps and larger units. For distribution of losses by branch within division's, table 4-2 applies. For distribution of nonbattle losses, d(3) above applies.

(3) *Example.* Calculate the number of replacements required to bring 1st Corps to authorized strength and to maintain it at that strength

Table 4-4. Personnel Losses (Korean War)¹

Infantry Divisions						
1	1	2	3	4	5	6
	Type of operation	Battle losses per division per day ¹	Battle losses per division—percentage per month ¹	Status distribution—percentage		
				Killed	Wounded	Missing
Offensive:						
2	Against main enemy force	67	11.2	14.6	83.2	2.3
Against delaying force:						
3	Organized	26	4.3	18.2	69.2	12.2
4	Partly disorganized	12	2.0	18.8	75.9	5.3
5	Against fortified hill positions	34	5.7	17.5	79.4	3.1
Defensive:						
6	Against main enemy force	77	12.8	25.2	68.8	6.2
7	Main pressure on non-U.S. units	35	5.8	16.1	70.6	13.2
8	Withdrawal	119	19.8	15.2	44.5	40.2
9	Positional warfare	6	1.0	18.6	75.0	6.4

¹ Based on experience 25 June 1950 to 25 July 1953.

² Based on assumed average divisional strength of 18,000.

in combat for 15 days, assuming no nuclear losses.
Given —

Unit	Authorized Strength	Assigned strength
Three infantry divisions.....	52,419	44,780
One armored division.....	18,057	15,604
Corps nondivisional troops.....	46,101	38,322
Total corps.....	116,577	98,706

(a) *Replacements needed now.*

Authorized (116,577)	
assigned (98,706).....	17,871

(b) *Estimated losses, 15 days.*

Infantry Divisions (Table 4-3, line 2):	
Battle losses $\frac{1}{2} \times 10$ percent $\times$ 52,419.....	2,621
Nonbattle losses $\frac{1}{2} \times 8$ percent $\times$ 52,419.....	2,096
One armored division (table 4-3, line 3):	
Battle losses $\frac{1}{2} \times 8$ percent $\times$ 18,057.....	724
Nonbattle losses $\frac{1}{2} \times 7$ percent $\times$ 18,057.....	634
Corps nondivisional troops (table 4-3, line 5):	
Battle losses $\frac{1}{2} \times 1.25$ percent $\times$ 46,101.....	288
Nonbattle losses $\frac{1}{2} \times 3.0$ percent $\times$ 46,101.....	692
Total losses for 15 days.....	7,055

(c) *Total replacements required.*

Replacements needed now.....	17,871
Losses for 15-day period.....	7,055
Total.....	25,926

Table 4-5. Types of Battle Losses as Percentage of Total Battle Losses

1	2	3	4
Battle losses	Infantry divisions (percentage)	Armored divisions (percentage)	Corps and field army nondivisional units (percentage)
2 Killed.....	16.5	18.0	16.0
3 Wounded.....	70.0	72.0	84.0
4 Captured and missing..	13.5	10.0	(*)

* Negligible.

Table 4-7. Special Estimates for Airborne Operations

1	2	3	4	5	6	7
Type of operation and type of forces committed	First day (includes en route and in airhead) (percentage)			Succeeding days (percentage) ¹		
	Nonbattle loss	Battle loss	Total	Nonbattle loss	Battle loss	Total
Airborne assault operation:						
Airborne or infantry division and attached troops:						
2 Assault echelon (parachute and/or assault aircraft) ²	0.3	9.3	9.6	0.3	2	2.3
3 Follow echelon.....	.3	2.5	2.8	.3	2	2.3
4 Corps troops.....	.3	1.5	1.8	.3	1	1.3
Air-landed operation (inside secured airhead):						
5 Airborne or infantry division and attached troops (to include replacements committed to combat upon arrival) ³	.3	4.3	4.6	.3	2	2.3
6 Corps troops.....	.3	1.5	1.8	.3	1	1.3

¹ Upon linkup or when forces in the objectives area are firmly established, rates and methods given in d or e above for an infantry division are applicable.

² For planning purposes and in the absence of experience factors, casualty figures for air-landed assault forces are assumed to be the same as for parachute assault forces.

³ If not committed to combat, assess losses as for corps troops.

Table 4-6. Distribution of Battle Losses by Branch Within Corps and Larger Units in the Combat Zone as Percentage of Total Battle Losses

1	2	3
Branch	Percentage	
	World War II	Korea War
2 Infantry.....	81.9	81.1
3 Artillery.....	4.5	
Field.....	(3.6)	5.7
Air defense.....	(0.9)	
4 Armour.....	6.6	5.3
5 Corps of Engineers.....	3.2	
6 Army Medical Service.....	2.8	
7 Signal Corps.....	.2	
8 Quartermaster Corps.....	.1	
9 Ordnance Corps.....	.2	7.9
10 Transportation Corps.....		
11 Chemical Corps.....	.3	
12 Military Police Corps.....	.1	
13 Miscellaneous.....	.1	

Note. The percentage figures given in the World War II portion of this table are the field battle loss distribution as reported through data processing unit channels, European Theater of Operations, for the period 6 June 1944 through 31 March 1945. The figure for armor combines the percentage originally reported as armored forces (2.9 percent), tank destroyer (1.4 percent), and cavalry (2.3 percent). In actual operations, the distribution of battle losses by branch varies with the composition of the force, type of operation, etc.

f. *Special Estimates for Airborne Operations.*

(1) Personnel losses for forces conducting an airborne assault operation may be established by applying the applicable daily loss rates from table 4-7 to the assigned strength of units actually committed to the operation.

Note. Rates in this table are for planning purposes only. The rates for each airborne operation differ. The rates in this table are useful as a guide or for use in practicing estimate procedures.

(2) *Example:* Calculate the number of non-nuclear losses that will be sustained by the 102d Airborne Division on D-day and D + 1. Take-off times and H-hour are on D-day. Computations for followup echelon are omitted from this example. Strength of the division 13,484 is echeloned as follows:

Unit	Strength
Assault echelon.....	11,571
Followup echelon.....	868
Rear echelon.....	1,045
Airhead—first day: (Table 4-7, line 2)	
Assault echelon (11,571 × 0.096).....	1,111
Airhead—second day: (Table 4-7, line 2)	
Assault echelon (11,571 - 1,111) × 0.023.....	241
Total losses D-day and D + 1.....	1,352

g. Special Estimates for Amphibious Operations.

(1) Nonnuclear personnel losses for amphibious forces establishing a beachhead may be estimated by applying the applicable daily loss rates from table 4-8 to the assigned strength of units actually committed in the beachhead or en route thereto.

Note. Rates in this table are for planning purposes only. The rates for each amphibious operation differ. The rates in this table are for use as a guide only or in practicing estimate procedures.

(2) The amount and the type of reinforcement required by divisions making amphibious landings differ for each operation because the force must organize to fit the mission, the area of operations, the lift available, and the enemy situation.

(3) *Example:* Calculate the total of non-nuclear losses that will be sustained during an

amphibious operation by 1st Corps on D - 1, D-day, and D + 1. The following computations are tabulated in table 4-9.

Unit	Assigned strength
1st Infantry Division.....	15,606
2d Infantry Division.....	15,606
3d Infantry Division.....	15,606
Nondivisional troops, assault echelon.....	22,632
Nondivisional troops, followup echelon.....	36,415
Total 1st Corps.....	105,865

Total 1st Corps will sail at assigned strength. On D-day the 1st and 2d Infantry Divisions will assault the beach in a helicopter and waterborne assault. 3d Infantry Division and nondivisional troops in followup echelon will land on D + 1.

(a) D - 1: *Losses at sea.*

1. <i>Assault divisions.</i>	
31,212 × 0.5 percent (table 4-8, colm 2, line 2).....	156
2. <i>Nondivisional assault troops.</i>	
22,632 × 0.5 percent (table 4-8, colm 2, line 3).....	113
3. <i>Followup division.</i>	
15,606 × 0.5 percent (table 4-8, colm 2, line 4).....	78
4. <i>Nondivisional followup troops.</i>	
36,415 × 0.5 percent (table 4-8, colm 2, line 5).....	182
5. Total 1st Corps D - 1 losses.....	529

(b) D-day:

1. <i>Assault landings.</i>	
(a) <i>Assault divisions.</i>	
(31,212 - 156) × 1.3 percent (table 4-8, colm 3, line 2).....	404
(b) <i>Nondivisional assault troops.</i>	
(22,632 - 113) × 1.0 percent (table 4-8, colm 3, line 3).....	225

Table 4-8. *Special Estimates for Amphibious Operations*

1	2	3	4	5	6	7	8	9
Force	Phase I—Forces en route		Phase II—Forces in beachhead					
	Daily at sea ¹	Landing	First day			Succeeding days ²		
	Nonbattle and battle loss (percentage)	Battle loss (percentage)	Nonbattle loss (percentage)	Battle loss (percentage)	Total (percentage) ³	Nonbattle loss (percentage)	Battle loss (percentage)	Total (percentage)
Assault forces: ⁴								
2 Divisions and attached troops.....	0.5	1.3	0.3	5.3	5.6	0.3	1.5	1.8
3 Corps and field army troops.....	.5	1.0	.3	3.0	3.3	.3	1.0	1.3
Followup forces: ⁵								
4 Divisions and attached troops.....	.5	.5				.3	1.5	1.8
5 Corps and field army troops.....	.5	.5				.3	1.0	1.3

¹ Rates in this column include both battle and nonbattle losses en route and are distributed by arm or service in the same proportion to the total losses as the strength of each arm or service is to the strength of the total force being transported.

² After beachhead is secure and forces are building up for the breakout (phase III), the rates and methods given in table 4-1 or tables 4-3 and 4-4 apply. The rates in this table apply only until the beachhead is firmly established.

³ Losses are distributed as given in d(3) above for nonbattle losses; table 4-2 or table 4-6 above for battle losses by arm or service; table 4-5 above for battle losses by category (killed, wounded, captured, and missing).

⁴ Assault forces in this table are those units who make their landing in the face of enemy opposition at or near the beachhead. For purposes of computing total division rates, the assumption is that an assault division lands 1 brigade by helicopter behind the beaches and 1 brigade over the beaches, followed by the reserve brigade and the remainder of the division.

⁵ Followup forces in this table include those landing over beaches secured by other friendly forces.

Table 4-9. Worksheet Form—Personnel Loss Estimates—Amphibious Operations

Table 4-5. Formulas for Computing Loss Estimates Amphibious Operations										
1	2	3	4	5	6	7	8	9	10	
	Forces	D - 1		D-day			D + 1			
		Rate (per-centage)	Strength	Losses	Rate (per-centage)	Strength	Losses	Rate (per-centage)	Strength	Losses
	Phase I—force at sea:									
2	Assault divisions.....	0.5	31,212	156	.....	.....	.....	.....	.....	.....
3	Nondivisional assault troops.....	.5	22,632	113	.....	.....	.....	.....	.....	.....
4	Followup division.....	.5	15,606	78	0.5	15,528	78	.....	.....	.....
5	Nondivisional followup troops.....	.5	36,415	182	.5	36,233	181	.....	.....	.....
	Landing:									
6	Assault divisions.....	.....	.....	.....	1.3	31,056	404	.....	.....	.....
7	Nondivisional assault troops.....	.....	.....	.....	1.0	22,519	225	.....	.....	.....
8	Followup division.....	.....	.....	.....	.....	.....	.....	0.5	15,450	77
9	Nondivisional followup troops.....	.....	.....	.....	.....	.....	.....	.5	36,032	180
10	Total—phase I.....	.....	.....	529	.....	.....	887	.....	.....	257
	Phase II—forces in beachhead:									
	Assault divisions:									
11	Nonbattle losses.....	.....	.....	.....	.3	30,652	92	1.8	28,936	521
12	Battle losses.....	.....	.....	.....	5.3	30,652	1,624			
	Nondivisional assault troops:									
13	Nonbattle losses.....	.....	.....	.....	.3	22,294	67	1.3	21,558	280
14	Battle losses.....	.....	.....	.....	3.0	22,294	669			
15	Followup division.....	.....	.....	.....	.....	.....	.....	1.8	15,373	277
16	Nondivisional followup troops.....	.....	.....	.....	.....	.....	.....	1.3	35,872	466
17	Total—phase II.....	.....	.....	.....	.....	.....	3,340	.....	.....	1,801

2. Nonbattle losses.

(a) Assault divisions.

$(31,212 - 156 - 404) \times 0.3$ percent
(table 4-8, colm 4, line 2)..... 92

(b) Nondivisional assault troops.

$(22,632 - 113 - 225) \times 0.3$ percent
(table 4-8, colm 4, line 3)..... 67

3. Battle losses. (Forces in beachhead)

(a) Assault divisions.

$(31,212 - 156 - 404) \times 5.3$ percent
(table 4-8, colm 5, line 2)..... 1,624

(b) Nondivisional assault troops.

$(22,632 - 113 - 225) \times 3.0$ percent
(table 4-8, colm 5, line 3)..... 669

4. Losses at sea.

(a) Followup division.

$(15,606 - 78) \times 0.5$ percent (table
4-8, colm 2, line 4)..... 78

(b) Nondivisional followup troops.

$(36,415 - 182) \times 0.5$ percent (table
4-8, colm 2, line 5)..... 181

5. Total 1st Corps D-day losses.

1 + 2 + 3 + 4..... 3,340

(c) D + 1:

1. Landing losses:

(a) Followup division.

$(15,606 - 78 - 78) \times 0.5$ percent (table
4-8, colm 3, line 4)..... 77

(b) Nondivisional followup troops.

$(36,415 - 182 - 181) \times 0.5$ percent
(table 4-8, colm 3, line 5)..... 180

2. Beachhead losses.

(a) Assault divisions.

$(31,121 - 156 - 404 - 92 - 1,624) \times$
1.8 percent (table 4-8,
colm 9, line 2)..... 521

(b) Nondivisional assault troops.

$(22,632 - 113 - 225 - 67 - 669) \times$
1.3 percent (table 4-8,
colm 9, line 3)..... 280

(c) Followup division.

$(15,606 - 78 - 78 - 77) \times 1.8$ percent
(table 4-8, colm 9, line 4)..... 277

(d) Nondivisional followup troops.

$(36,415 - 182 - 180) \times 1.3$ percent
(table 4-8, colm 9, line 5)..... 469

3. Total 1st Corps D + 1 losses.

1 + 2..... 1,804

4-7. COMMZ Estimates

a. In estimating the nonnuclear gross losses for all ground troops in the COMMZ, battle losses are considered negligible, and nonbattle losses are calculated at 0.5 percent per month. Arm or service distribution of nonbattle is determined by applying this nonbattle loss percentage to the strength of each arm or service in the command considered. When air superiority is lacking, the theater army planner must develop battle loss rates. Experience data for such rates do not exist.

b. Before a planner can estimate losses to nuclear weapons, he needs certain information on enemy capabilities (para 4-4). If he cannot obtain specific information, then he makes assumptions. By applying target analysis methods to selected critical target areas, he can evolve a basis for estimating nuclear losses. (See FM 101-10-3.)

Table 4-10. Theater Losses

Table 4-10. Evacuation Losses									
1	2	3	4	5	6	7	8	9	
Type of loss	Gross loss	Net losses (by evacuation policy)							
		15 days	30 days	60 days	90 days	120 days	150 days	180 days	
2 Sick/disease and nonbattle accident/ injuries.....	1.62	0.61	0.28	0.15	0.11	0.08	0.05	0.05	
3 Battle casualties.....	.78	.69	.60	.47	.41	.37	.35	.33	
4 Killed.....	(.14)	(.14)	(.14)	(.14)	(.14)	(.14)	(.14)	(.14)	
5 Wounded/injured in action.....	(.55)	(.46)	(.37)	(.24)	(.18)	(.14)	(.12)	(.10)	
6 Captured and missing in action.....	(.09)	(.09)	(.09)	(.09)	(.09)	(.09)	(.09)	(.09)	

Note: Factors expressed as number per 100 strength per day.

4-8. Theater Estimates—Nonnuclear

(See FM 101-10-3 for theater estimates — nuclear.)

a. *General.* The wide range of loss rates pertinent to potential U.S. Army areas of operations makes infeasible the presentation of a single set of loss factors for worldwide application. The following table (European data base), however, illustrates what can be done in formulating a theater-level estimating tool using the admission to hospital rates shown in paragraphs 4-9 through 4-24. This table is designed for only rough, quick estimates, not as a substitute for factors carefully chosen to fit the specific assumptions and condi-

tions of a particular operational plan. Nonbattle dead and missing are considered negligible for purposes of this estimate.

b. *Estimation of Losses.* Losses may be estimated by using table 4-10 or by —

(1) Determining battle casualty and nonbattle casualty losses of combat zone troops (para 4-6) :

(a) Divisional.

(b) Nondivisional.

(2) Determining nonbattle accident/injury or troops in the COMMZ (para 4-7).

(3) Adding (1) and (2) above.

Section III. EVACUATION AND HOSPITALIZATION

4-9. Classification of Patients

a. The term "patient" includes all sick, injured, or wounded personnel receiving medical care or treatment. For purposes of discussion herein, only those patients who require hospitalization or who are excused from performing military duty and not returned to duty within the calendar day of admission to a medical treatment facility are considered. Patients may be classified in several ways, depending on the purpose for which classification is made. It is important to note that not all casualties or nonbattle losses are *patients*.

b. In making estimates of patients or in computing hospital bed requirements, patients are usually classified by cause of disability into *sick/disease*, *nonbattle accident/injury*, and *wounded or injured in action*. The latter group falls in the category of battle losses.

c. Patients may be classified as *hospital patients* or *quarters patients*.

d. In calculating evacuation requirements, patients may be classified by —

(1) Severity of disability as *ambulatory* and *litter patients*.

(2) Suitability for evacuation as *evacuatable* and *nontransportable* patients.

(3) Suitability for evacuation by air.

4-10. Admission Rate

The incidence of disease, injury, and wounding usually is expressed in the Military Services in terms of the number of admissions per 1,000 average strength per year. The admission rate may be for all causes, for all diseases, for all nonbattle accidents/injuries, or for all battle wounds or injuries. For purposes of planning for hospitalization requirements, the admission rate is most conveniently expressed as a *rate of admission to hospital* per 1,000 strength per day.

4-11. Sick/Disease and Nonbattle Accidents/Injuries

Sick/disease and nonbattle accident/injury cases among combat troops of a seasoned command, except in a particularly unhealthy region, may be expected to produce a rate of admission to medical treatment facilities (hospital and quarters combined) of about three per 1,000 per day (0.3 percent per day). This *average* rate can be expected at certain seasons of the year, without epidemics, to reach 0.5 percent or even more. As an estimate for planning, *one-third* of these patients may be expected to remain under treatment in their own organization (at aid stations) or in the division clearing stations *if there is no inter-*

ference with the primary mission of reception, treatment, and evacuation of casualties. About two-thirds of the sick/disease and nonbattle accident/injury cases may be evacuated from the division area.

4-12. Wounded or Injured in Action

a. In estimating battle injuries and wounds, many variable factors must be considered. These include type of troops, their location in the theater, type of engagement, and enemy capabilities. For this reason, it is desirable in such estimates to separate all troops in a theater into groups having approximately the same casualty rate and compute the patients separately for each group on the basis of their numerical strength. For example, in a given theater the troops may be grouped into combat divisions, other ground troops in the combat zone, Air Force troops, and troops in the COMMZ. Each of these groups will have a different battle injury and wound rate, and the total patients in the theater will depend on the relative strength of each group.

b. In estimating battle injury and wound patients in a field army, an estimate based on combat divisions engaged usually is more accurate than one based on a rate for corps or the field army.

c. Considerable variation in battle injury and wound admission rates among Air Force troops occurs, depending on the type of aircraft, type of mission flown, and amount of enemy air resistance. As an overall average, which necessarily must be modified to apply to any special situation, the battle injury and wound admission rate for all air troops can be taken as 0.2 per 1,000 per day. More commonly, casualties in Air Force troops are computed on the basis of the number of man-missions flown.

d. The number of battle injuries and wounds among COMMZ troops, except in special situations, has been negligible in the past. However, in future warfare the possible use of sophisticated conventional weapons and nuclear weapons or both in rear areas must be considered in estimating patient workloads.

4-13. Statistics

Table 4-11 indicates estimated hospital admission rates for broad geographic areas based on World War II and Korean War experience and subsequent study of the world health situation. These rates should be used only as a basis for planning gross theater-level medical service support. Each rate represents a first-year experience typical of the area involved. (When data are aggregated for

greater or lesser periods, the same experience source produces significantly different rates.) The medical planner must modify these rates, using the latest pertinent medical intelligence data, before he applies them in developing medical workloads and bed requirements for a specific plan or campaign.

Table 4-11. Rate of Admission to Hospital Per 1,000 Strength Per Day*

1	Area	1	2	3
			Sick/disease and nonbattle accidents/injuries	Wounded or injured in action
2	North America		1.36	0.55
3	Europe		1.62	0.55
4	Asia		2.07	0.37
5	Africa		2.87	0.37
6	Middle East		1.96	0.37
7	South America		1.72	0.37

*In using experience factors from theaters of operation, remember that wounded or injured in action rates are not primarily related to geography. In using such rates for planning, the theater must be considered from the standpoint of type of combat, size and organization of forces, and weapon employment.

4-14. Accumulation Factors

In estimating the hospital inpatient workload that will develop in a planned operation, a knowledge of the rate at which hospital patients accumulate is necessary. The accumulation factor depends on two considerations. First, the length of treatment time varies considerably according to types of patients admitted. Second, the maximum length of time allowed for patient stay in an overseas hospital is limited by the applicable theater evacuation policy. Accumulation factors (table 4-12) indicate how many patients will have accumulated at specified periods of time after the beginning of operations, based on a constant admission rate of one patient per day and a constant, fixed evacuation policy. Separate sets of factors are provided for the different evacuation policies and for separate theater and CONUS accumulation of patients as affected by these evacuation policies.

4-15. Evacuation Policy

The Secretary of Defense establishes the evacuation policy of a joint theater of operations, usually on the recommendation of the Joint Chiefs of Staff, theater commander, or the Military Departments. The evacuation policy determines which patients will be evacuated to the CONUS by designating a maximum number of days for the allowable period of hospitalization in the theater. Patients who, in the opinion of responsible medical officers, cannot be returned to duty status within the period prescribed are to be returned to the CONUS by the first available and suitable

Table 4-12. Accumulation Factors* (Periods of Estimate in Intervals of 30 Days)

		1	2	3	4	5	6	7	8	9	10	11	12
THEATER FACTORS													
Evacuation policies													
1	Periods of estimate	120-day		90-day		60-day		30-day		15-day		Periods of estimate	
		Sick/disease and nonbattle accidents/injuries	Wounded or injured in action	Sick/disease and nonbattle accidents/injuries	Wounded or injured in action	Sick/disease and nonbattle accidents/injuries	Wounded or injured in action	Sick/disease and nonbattle accidents/injuries	Wounded or injured in action	Sick/disease and nonbattle accidents/injuries	Wounded or injured in action		
2	30-----	13.43	22.96	13.34	22.39	13.11	21.04	11.40	16.44	7.32	10.80	30	
3	60-----	16.46	33.38	15.95	31.00	14.67	25.57	11.40	16.44	7.32	10.80	60	
4	90-----	17.67	37.36	16.51	32.87	14.67	25.57	11.40	16.44	7.32	10.80	90	
5	120-----	17.94	38.27	16.51	32.87	14.67	25.57	11.40	16.44	7.32	10.80	120	
6	150 and over---	17.94	38.27	16.51	32.87	14.67	25.57	11.40	16.44	7.32	10.80	150 and over	
CONUS FACTORS													
7	30-----	0.13	1.55	0.22	2.12	0.45	3.47	2.16	8.07	6.24	13.71	30	
8	60-----	0.76	6.88	1.27	9.26	2.55	14.69	5.82	23.82	9.90	29.46	60	
9	90-----	1.80	13.43	2.69	17.92	4.80	25.22	8.07	34.35	12.15	39.99	90	
10	120-----	3.06	20.35	4.49	25.75	6.33	33.05	9.60	42.18	13.68	47.82	120	
11	150-----	4.05	26.59	5.48	31.99	7.32	39.29	10.59	48.42	14.67	54.06	150	
12	180-----	4.67	31.66	6.10	37.06	7.95	44.36	11.21	53.49	15.29	59.13	180	
13	210-----	5.05	35.86	6.48	41.26	8.32	48.56	11.59	57.69	15.67	53.33	210	
14	240-----	5.29	39.40	6.72	44.80	8.56	52.10	11.83	61.23	15.91	66.87	240	
15	270-----	5.44	42.37	6.87	47.77	8.71	55.07	11.98	64.20	16.06	69.84	270	
16	300-----	5.54	44.89	6.97	50.29	8.81	57.59	12.08	66.72	16.16	72.36	300	
17	330-----	5.60	47.02	7.03	52.42	8.87	59.72	12.14	68.85	16.22	74.49	330	
18	360-----	5.64	48.79	7.07	54.19	8.92	61.49	12.18	70.62	16.26	76.26	360	
19	390-----	5.67	50.26	7.10	55.66	8.94	62.96	12.21	72.09	16.29	77.73	390	
20	420-----	5.70	51.46	7.13	56.86	8.97	64.16	12.24	73.29	16.32	78.93	420	
21	450-----	5.71	52.39	7.14	57.79	8.98	65.09	12.25	74.22	16.33	79.86	450	
22	480-----	5.72	53.14	7.15	58.54	8.99	65.84	12.26	74.97	16.34	80.61	480	
23	510-----	5.73	53.71	7.16	59.11	9.00	66.41	12.27	75.54	16.35	81.18	510	
24	540-----	5.73	54.16	7.16	59.56	9.00	66.86	12.27	75.99	16.35	81.63	540	
25	570-----	5.73	54.52	7.16	59.92	9.00	67.22	12.27	76.35	16.35	81.99	570	
26	600-----	5.73	54.79	7.16	60.19	9.00	67.49	12.27	76.62	16.35	82.26	600	
27	630 and over---	5.73	55.00	7.16	60.40	9.00	67.70	12.27	76.83	16.35	82.47	630 and over	

*Based on constant admission of one per day under stated evacuation policies.

transportation, provided travel will not aggravate their disabilities. In using the evacuation policy to determine theater fixed-bed requirements, the periods usually considered are 30, 60, 90, or 120 days.

a. Evacuation policies within a theater may be established for certain areas and for certain types of medical facilities, specifying which patients will be evacuated to the next higher echelon of medical care. For example, a shorter evacuation policy may be established for station hospitals than for the theater as a whole. This means that a patient whose recovery in a station hospital is likely to require more than the number of days in the shorter policy will be evacuated to a general hospital. This operation in no way affects the total fixed-bed requirements of the theater, provided proper adjustment is made in the distribution of total theater fixed beds between station and general hospitals on the basis of their different evacuation policies.

b. Certain flexible evacuation policies, useful as guides but varying with manpower policies, admission rates, and available beds, may be established for the combat zone.

c. By setting a maximum number of days that a patient may be retained in theater hospitals, the evacuation policy exercises a limiting effect on the growth of the patient load in the theater. While the evacuation policy alone does not enter directly as a computational factor in the estimation of fixed-bed requirements, it does determine the set of accumulation factors to use.

4-16. Dispersion Factor

At any given time, a certain proportion of theater fixed beds will not be immediately available to patients because of "dispersion."

(A 20-percent allowance for dispersion generally was used during World War II.) Factors contributing to dispersion are as follows:

a. A certain number of beds must be packed and in transit. The greater the mobility of the troops, the greater the allowance required.

b. Smaller troop units operating at some distance from the main body of troops must be supported by complete hospital units even though these units are not likely to use fully the hospital facilities provided.

c. The general practice of prescribing separate wards for patients of different sexes, cases of contagious diseases, and cases requiring different types of treatment necessitates a safety margin in each ward because the proportion of the various cases will vary from time to time.

d. Factors to be applied to the number of patients to convert to the number of fixed beds required under each specified dispersion allowance are as follows:

<i>Dispersion allowance (percentage)</i>	<i>Dispersion factor</i>
5.....	1.05
10.....	1.11
15.....	1.18
20.....	1.25
25.....	1.33
30.....	1.43
35.....	1.54
40.....	1.67
45.....	1.82
50.....	2.00

4-17. Disposition Factors

The factors in table 4-13, expressed as percentage of total hospital admissions, may be used to develop gross theater-level estimates for disposition of sick/disease and nonbattle accident/injury patients and of battle injury and wound patients for each of the specified theater evacuation policies. Data for detailed calculations of disposition under various policies are given in FM 8-55.

4-18. Fixed-Bed Requirements—Basic Data

a. *Method.* For planning purposes, requirements for fixed beds in a theater of operations can be determined by using a factor of 7 percent of the theater of operations strength. This method is recommended for planning for an entire theater of operations only and is not applicable for individual segments of any theater. Computation

Table 4-13. Disposition Factors

1	Evacuation policy	Sick/disease and nonbattle accidents/injuries			Wounded or injured in action		
		Died	Returned to duty	Evacuated from theater	Died	Returned to duty	Evacuated from theater
2	180-day.....	0.21	96.85	2.94	2.07	81.76	16.17
3	150-day.....	0.20	96.71	3.09	2.06	78.81	19.13
4	120-day.....	0.19	95.08	4.73	2.05	74.55	23.40
5	90-day.....	0.18	93.39	6.43	2.03	68.11	29.86
6	60-day.....	0.17	90.59	9.24	1.95	56.05	42.00
7	30-day.....	0.15	82.55	17.50	1.88	32.12	66.00
8	15-day.....	0.14	62.36	37.50	1.74	16.52	81.74

of fixed-bed requirements for specific situations, or in cases that require more detailed data, should be made using the method described in succeeding paragraphs.

b. General. To compute bed requirements for any specific situation, certain basic data are necessary. These are —

(1) Time period covered. (Period of estimate, usually 30-day intervals.)

(2) Troop strength. (Population covered.)

(3) Daily admission rate. (Rate of generation of patients.)

(4) Experience factors for accumulation of patients, dependent on evacuation policy. (Rate of patient-load growth.)

(5) Dispersion factor. (Patient-bed conversion factor.)

All experience factors ((4) above) are based on the proportion of those patients admitted to hospital on one day and remaining on each succeeding day. When these daily remaining factors

(proportions) are accumulated by intervals of 30 days, the resultant accumulation factors can be used directly, provided the admission rate, troop strength, and evacuation policy are assumed to be constant. However, when any or all elements of admission rate, troop strength, or evacuation policy vary for one or more of the 30-day intervals in the first time period covered, the daily remaining factors may be accumulated through a 30-day period, at which time admissions cease, and then diminished each succeeding day thereafter. For tables of factors to be used for such computations and their detailed method of use, see FM 8-55.

4-19. Computations

a. Formula. Given the items of basic data, the fixed-hospital bed requirements for a specific situation, wherein the elements of admission rate, troop strength, and evacuation policy are assumed to be constant during the time period covered, can be computed according to the following formula:

$$\begin{array}{cccccc} \text{Daily} & & & \text{Accumulation} & & \\ \text{admission} & \times & \text{Average} & \text{factor at time} & \times & \text{Dispersion-} \\ \text{rate} & & \text{strength} & \times \text{period covered} & \times & \text{factor} \\ & & \text{(thousands)} & \text{in estimate} & & \\ & & & & & = \text{Fixed} \\ & & & & & \text{beds} \end{array}$$

Example. Theater A has a troop strength of 500,000. Expected daily admission rates per 1,000 are as follows: sick/disease and nonbattle accidents/injuries, 0.73; conventional battle injuries and wounds, 0.34. Theater evacuation policy is 120 days and the dispersion allowance is 20 percent. How many fixed-hospital beds will be required at the end of 90 days?

	Admission rate		Troop strength (thousands)		Accumulation factor (90 days)		Dispersion factor		Fixed beds
Sick/disease and nonbattle accidents/ injuries.....	0.73	×	500	×	17.67	×	1.25	=	8,062
Conventional battle losses.....	0.34	×	500	×	37.36	×	1.25	=	7,939
Total fixed beds required at the end of 90 days.....									16,001

In the above example, the accumulation factors were obtained from table 4-12 (para 4-14). The proper accumulation factor is shown on line 4 in both instances — column 2 for sick/disease and nonbattle accident/injury patients and column 3 for battle injury and wound patients.

b. Nuclear, Biological, and Chemical Operations. While the preceding computations afford a relatively sound basis for determining fixed-bed requirements, nuclear, biological, and chemical operations introduce other factors. The experience factors in this chapter have been derived in the presence of a certain pattern of wounding and are related to average admission rates over long periods. The pattern of wounding from nuclear, biological, and chemical munitions will probably alter accumulation factors. Of greatest significance, however, may be the characteristic-

ly wide fluctuation of daily admission rates resulting from these munitions. This characteristic may ruin any attempt to employ average admission rates. The problem will be one of handling recurring peakloads of patients. This problem must be met either by efficient use of theater hospital facilities or by rapid and extensive evacuation to the CONUS. For this reason, the planner may find it more realistic to submit fixed-bed requirements as a feasible percentage of troop strength supported and build the maximum flexibility into the resulting medical service. There are, however, factors and methods for estimating hospitalization and evacuation requirements. For data pertaining to nuclear warfare, see FM 101-10-3.

4-20. CONUS

a. Fixed beds are required in the CONUS for those troops who do not depart for theaters of

Table 4-14. Accumulation of Theater of Operations Patient in CONUS Hospitals (120-Day Evacuation Policy)*

1	Cause of admission	2 Daily hospital admission rate per 1,000	3 Accumulation of theater patients in CONUS hospitals per 1,000 theater strength after number of days indicated following start of operations in the theater					8
			60	90	120	180	260	
2	Sick/disease and nonbattle accidents/injuries.....	1.0	0.60	1.07	1.50	3.11	4.08	4.17
3	Wounded or injured in action.....	0.6	2.05	5.20	8.79	16.32	26.43	28.48
4	Total patients.....		2.65	6.27	10.29	19.43	30.51	32.65
5	Increase by 28 percent.....		0.66	1.57	2.57	4.86	7.63	8.16
6	Total beds required.....		3.31	7.84	12.86	24.29	38.14	40.81

*Based on July to December 1944 ETO admission rates.

operations. When new recruits are inducted in large numbers, morbidity tends to be rather high, and beds equal in number to as much as 4 percent of the CONUS strength may be necessary. After the period of training is over, beds equal in number to 3 percent of the CONUS strength may be sufficient.

b. Bed requirements must be computed for those cases evacuated from theaters of operation. These additional beds are estimated on the basis of the expected numbers of evacuees arriving in

the CONUS. (Sick/disease and nonbattle accident/injury and battle injury and wound cases are considered separately and the average duration of stay of such cases in CONUS hospitals (table 4-14.)

c. Using the data given for the problem in paragraph 4-19a, the accumulation of theater of operations patients in CONUS hospitals after 90, 150, and 360 days of operation in the theater (under a 120-day evacuation policy) may be determined as follows:

	Daily admission rate		Troop strength (thousands)		Accumulation factors		
					90 days	150 days	360 days
Sick/disease and nonbattle accidents/injuries.....	0.73	×	500	×	1.80	4.05	5.64
Conventional battle losses.....	0.34	×	500	×	13.43	26.59	48.79
Total patients—							
Sick/disease and nonbattle accidents/injuries.....					657	1,478	2,059
Battle injuries and wounds.....					2,283	4,520	8,294
					2,940	5,998	10,353
Dispersion allowance 20 percent.....		×		×	1.25	1.25	1.25
Total beds required.....					3,675	7,498	12,941

In the above example, the accumulation factors were obtained from table 4-12 (lines 9, 11, and 18 respectively — column 2 for sick/disease and nonbattle accident/injury patients and column 3 for battle injury and wound patients).

d. An allowance, to the above figures must be

added when appropriate, for care of Navy, Air Force, and allied military personnel; allied civilians; and prisoners of war. The additional number of fixed beds for such purposes will depend on the particular area involved, and no definite figures can be given.

Table 4-15. Sick/Disease and Nonbattle Accidents/Injuries Evacuated From Theater

1	Evacuation policy	Percentage during specified interval					Total evacuated from theater
		1-30 days	31-60 days	61-90 days	91-120 days	121-150 days	
2	120-day.....	0.44	1.73	1.49	0.88	0.19	4.73
3	90-day.....	0.74	2.83	2.26	0.60		6.43
4	60-day.....	1.51	5.57	2.16			9.24
5	30-day.....	7.22	10.08				17.30
6	15-day.....	26.89	10.61				37.50

Table 4-16. Wounded or Injured in Action Evacuated From Theater

1	Evacuation policy	2	3	4	5	6	7
		Percentage during specified interval					Total evacuated from theater
		1-30 days	31-60 days	61-90 days	91-120 days	121-150 days	
2	120-day	5.15	12.62	4.06	1.34	0.23	23.40
3	90-day	7.07	16.74	5.07	0.98		29.86
4	60-day	11.56	25.84	4.60			42.00
5	30-day	26.90	39.10				66.00
6	15-day	49.99	31.75				81.74

4-21. Patient Evacuation—Planning Factors

Percentages of personnel evacuated from theater out of admissions during 1 month of operations are shown in tables 4-15 and 4-16.

4-22. Capacity of Transportation

The capacity of selected items of transportation equipment for evacuating patients is shown in table 4-17.

a. Exact figures for Army aircraft in columns 2 and 3 must be computed on maximum gross weight.

b. Cargo vehicles are used only when ambulances are not available.

4-23. Time Elements of Evacuation

Factors for evacuation of personnel (including loading and unloading) are indicated in *a* and *b* below.

a. Litter squads.

(1) Average terrain, four-man squad — 900 meters and return in 1 hour.

(2) Mountainous terrain, six-man squad — 370 meters and return in 1 hour.

b. Ambulance, Motor, During Combat in Division Area. Eight kilometers and return in 1 hour.

(1) Helicopter. Eighty kilometers one way in 1 hour.

(2) Transport airplane. One hundred and sixty kilometers one way in 1 hour.

(3) Army airplane. One hundred and twenty kilometers one way in 1 hour.

4-24. Army Medical Service

a. The mobile army surgical hospital (TOE 8-571) provides resuscitative surgery and medical treatment necessary to prepare critically injured or ill patients received from division medical elements for extended evacuation. The unit can handle 60 patients.

b. The 400-bed evacuation hospital (TOE 8-581) is the primary means of providing hospitalization to field army troops. Austere medical treatment can be provided for up to 600 patients in an emergency.

c. The field army medical brigade headquarters (TOE 8-112) provides command, control, planning, and continuous operation of the field army

Table 4-17. Capacity of Transportation for Patient Evacuation

1	Type of transportation	2	3
		Patients	
		Ambulatory or Litter	
2	Transport airplane (C-7A) ^a	32	20
3	Transport airplane (C-123) ^a	61	50
4	Transport airplane (C-124) ^a	200	127
5	Transport airplane (C-130) ^a	92	74
6	Transport airplane (C-133) ^a	120	55
7	Transport airplane (C-135) ^a	126	44
8	Transport airplane (C-141) ^a	154	80
9	Army airplane (O-1A, E)	1	1
10	Army airplane (U-1A)	10	4
11	Army airplane (U-6A)	5	2
12	Army airplane (U-8D, F)	5	
13	Army airplane (U-21A)	10	3
14	Army helicopter (OH-6A)	2	2
15	Army helicopter (OH-13S)	2	2
16	Army helicopter (OH-23G)	2	2
17	Army helicopter (UH-1B)	3	7
18	Army helicopter (UH-1D)	12	6
19	Army helicopter (UH-1H)	14	6
20	Army helicopter (CH-47B, C)	33	24
21	Bus, motor, 37-passenger, convertible	37	18
22	Truck, ambulance, frontline, ¼-ton, 4x4	5	3
23	Truck, ambulance, field, ¾-ton, 4x4	8	4
24	Truck, cargo, 2 ½-ton, 6x6	16	18
25	LARC-V	25 ^b	12
26	LARC-LX	125	
27	Railway car, coach (U.S.)	52	
28	Railway car, coach (foreign)	57-72	
29	Pullman car (U.S.)	48	32
30	Sleeping car (foreign)	32	32
31	Ambulance car, ward (U.S.)	27	27
32	Ambulance car, ward (foreign)	24	30
33	Ambulance car, personnel (foreign)	21	21
34	LVT	12	6
35	LVTP-5	34	
36	LVTP-6	20	
37	LCVP	36	17 ^c
38	LCM(6)	120	30
39	LCM(8)	200 ^d	50 ^e
40	LCU	400	100
41	LST	180	120
42	Hospital ship (AH)	802	802

^a Based on capacity.

^b No troop seats provided.

^c Only seven litters if LCVP is to be hoisted aboard for loading.

^d In addition to litter patients.

^e In addition to ambulatory patients.

medical service. Execution of the medical service mission is accomplished through centralized control of decentralized operations.

d. The medical clearing company (TOE 8-128) receives, sorts, and provides emergency or resuscitative treatment for patients until evacuation and provides definitive treatment for patients with minor illness, wounds, or injuries.

e. The medical collecting company (TOE 8-129) provides litter support in the combat zone.

f. The army medical depot (TOE 8-667) installation receives, stores, and issues medical supplies; operates the field army medical inventory control point (ICP); performs field maintenance functions on Army Medical Service equipment; inspects and supervises organizational maintenance of Army Medical Service equipment; fabri-

cates and repairs spectacles; and distributes whole blood to medical facilities. The three advance platoons normally operate in the corps area. The platoon can support independent corps operations.

g. The army medical laboratory (TOE 8-650) furnishes service within a theater of operations.

h. See table 4-18 for hospital density in the theater.

Table 4-18. Evacuation and Hospitalization Factors

1		2
1	Kind of hospitalization	Quantity required
	Mobile hospitals:	
2	Evacuation, semimobile...	2 per division.
3	Mobile-army surgical....	1 per division.
4	Fixed-hospital beds in the theater of operations.	7 percent of theater of operation strength.

Section IV. PRISONERS OF WAR

4-25. General

a. To insure the availability of necessary resources and to make necessary arrangements for the reception, care, use, and disposition of enemy prisoners of war (PW) and enemy civilian internees, a planner estimates as closely as possible for a given period or for a specific operation the number of enemy —

- (1) PW's that will be captured.
- (2) Civilians that will be interned.
- (3) PW's that will be retained in the theater of operations.
- (4) PW's that will be evacuated from the theater of operations.

b. Extensive nonnuclear warfare experience factors are available with respect to the capture and evacuation of enemy PW's. Based on these experience factors, capture and evacuation rates, expressed mainly in terms of averages, have been developed and incorporated into this section. Nevertheless, planners should remember that prisoners are not characteristically captured at a uniform rate and the figures cited in this section represent averages that may be greatly altered by such influencing factors as —

- (1) Enemy morale.
- (2) Avenues of withdrawal open to enemy troops.
- (3) Ability of friendly forces to encircle or cut off enemy units.
- (4) Type of operation in which friendly forces are engaged; i.e., attack, defense, retrograde.
- (5) Operational environment.
- (6) Relative strength and sophistication of enemy forces.

(7) Intensity and effectiveness of ideological indoctrination of enemy troops.

(8) Intensity and effectiveness of friendly psychological operations.

c. Available experience factors regarding the internment and security of enemy civilians do not permit the development of planning factors as reliable as those for enemy PW's. The number of enemy civilians that will be interned in specific situations may vary greatly. Planners may, however, develop workable estimates using the factors cited in this section as modified by such considerations as —

- (1) Extent to which enemy civil authorities and agencies work with enemy military forces.
- (2) Intensity and effectiveness of ideological indoctrination of enemy officials and the general populace.
- (3) Intensity and effectiveness of friendly psychological operations aimed at influencing the enemy civil populace.
- (4) Extent to which the enemy populace supports the political and military goals of the enemy government.

4-26. PW Capture Rates, Nonnuclear Conditions

a. *General.* The figures and planning factors presented in this paragraph are based primarily on the experiences of U.S. Army forces in World War II and the Korean War. Of necessity, the experiences represented are those of the kind of organizations, principally divisions, that existed during those two wars. Present-day infantry, armored, and airborne divisions are sufficiently similar to their predecessor organizations to make

these experience factors applicable. In the case of the infantry division (mechanized), organized since Korea, the figures and factors cited represent interpolations based on the organizational and operational characteristics of the new organization. Data have not yet been developed for the airmobile division.

b. Division and Corps Estimates. Using the rates set forth below, estimates may be prepared directly for divisions and certain nondivisional units. By combining appropriate estimates developed from these tables, corps capture rates may be developed.

(1) *Equal force estimates.* When the number of opposing enemy forces and their sophistication are approximately equal to U.S. forces, the average number of enemy prisoners of war (PW) who may be expected to be captured per month can be estimated by using the percentage factors in table 4-19.

Table 4-19. Prisoner of War Capture Rates—Equal Force Estimates

1		2
1	Troops	Percentage of strength
2	Infantry divisions.....	1.35
3	Infantry divisions (mechanized).....	1.10
4	Armored divisions.....	.80
5	Airborne divisions.....	.65
Corps and field army nondivisional units:		
6	Armored cavalry regiments.....	.85
Separate combat brigades:		
7	Infantry brigades.....	.90
8	Infantry brigades (mechanized).....	.75
9	Armored brigades.....	.55
10	Airborne brigades.....	.45
11	Other units.....	(*)

*Negligible.

(2) *Unequal force estimates.* For the preparation of estimates for divisions (or comparable task forces) and corps in selected types of tactical operations against a numerically inferior enemy, the daily rates in table 4-20 may be used. These figures apply to all types of divisions, except the airmobile division and as otherwise indicated,

Table 4-20. Prisoner of War Capture Rates—Unequal Force Estimates

1		2
1	Force and operation	Number of prisoners captured per day
2	Average per division in all types of operation.....	47
3	Division in attack of a defensive position.....	50
4	Division in attack of a defensive position with complete surprise attained.....	700
5	Division in defense of a position against an unsuccessful enemy attack.....	300
6	Infantry division (mechanized) (or task force) in an encirclement operation.....	815
7	Armored division (or task force) in an encirclement operation.....	1,000

and are based primarily on the experiences of U.S. divisions in the Korean War and World War II against veteran enemy troops. In these instances, the U.S. forces were numerically superior by about 2 to 1.

c. Theater Estimates. For overall estimates at theater under nonnuclear conditions, the factors in table 4-21 may be used. Planners should be fully aware of limitations of these factors. They represent averages either derived from World War II and Korean War experience or interpolated from such experience. Since prisoners are not captured at uniform rates, special preparations are made for the reception of unusual numbers when tactical plans contemplate decisive action, such as cutting major routes of withdrawal or driving large enemy forces against an obstacle or when widespread enemy capitulation is anticipated.

Table 4-21. Prisoner of War Capture Rates

1		2	3	4	5
		Enemy prisoners of war per month			
1	Unit	Defense (U.S.)	Offense (U.S.)	Enemy First month	capitulation Succeeding month
2	Infantry division....	230	3,500	6,000	30,000
3	Infantry division (mechanized)....	175	3,550	6,000	30,000
4	Armored division....	117	3,600	6,000	30,000
5	Airborne division....	155	2,550	6,000	30,000

4-27. PW Capture Rates—Nuclear Conditions

a. Experience factors for basing estimates of PW capture rates under nuclear conditions are lacking. Using target analysis methods, however, planners can estimate enemy casualties and determine approximately the number of enemy personnel remaining in the strike area and subject to capture in the exploitation phase.

b. Because the employment of nuclear weapons produces a demoralizing effect on enemy troops, an overall increase in the number of enemy PW captured can be expected. In the absence of more definitive guidance, planners may apply a multiplier factor of 2 to the rates set forth in paragraph 4-26.

4-28. Evacuation of PW From the Theater of Operations

a. The Department of Defense, using recommendations from the Department of the Army or the Joint Chiefs of Staff, establishes the PW evacuation policy for the theater of operations. These policies are subject to change as the strategic and tactical situations change. Conceivably, some campaign plans may provide for the retention of all enemy PW in the active theater; in

other situations, all or a major proportion of the PW may be evacuated from the active theater. The evacuation policies for each major specific campaign are determined early in the planning phases so that the necessary resources for both retention and evacuation may be made available. The evacuation policy in all events must be consistent with the terms of the Geneva Conventions of 1949 and other applicable international agreements.

b. Table 4-22 reflects the number of enemy PW, expressed in terms of division slice, that will normally be retained within the active theater for labor and associated purposes. The figures in this table are based on empirical data derived from past experience, primarily of U.S. forces in Europe during World War II.

Table 4-22. Retention of Prisoners of War in Active Theater

1	2	
	Purpose for retention in theater	Number per division
2	To provide a theater PW labor pool.....	4,000
3	To provide for PW housekeeping, administration, etc.....	2,666
4	Total (division slice).....	6,666

4-29. Enemy Civilian Internees

a. *Internment.* The Department of Defense or the Department of the Army establishes broad policies regarding the internment of enemy civilians. In certain types of limited field operations, such as against an unsophisticated enemy in a stability operation environment, the number of enemy civilians interned may exceed the number of enemy PW captured. When military operations result in the movement of large numbers of refugees, potential civilian internees are invariably among the refugees. While no dependable internment rates can be established, the following percentage factors may be generally used in preparing estimates until such time as more specific guidance and information become available:

(1) Factors applicable to the local static population —

When the civilian population is—	Percentage of the population interned
Mainly hostile.....	0.1 to 0.5
Mainly friendly.....	0.05 to 0.1

(2) Factors applicable to the estimated number of refugees (estimates derived from these factors are added to those developed from the application of the factors in (1) above) —

When the refugees are—	Percentage of the refugees interned
Mainly hostile.....	2 to 5
Mainly friendly.....	0.1 to 0.5

b. *Evacuation.* In accordance with the provisions of the Geneva Convention Relative to the Protection of Civilian Persons in Time of War, civilian internees normally are not evacuated from the theater of operations but are retained within the occupied territory. Civilian internees are not evacuated beyond the bounds of the occupied territory except when, for material reasons, avoidance of such displacement is impossible.

4-30. Crime Rates

a. To make the necessary arrangements for the detection, investigation, and disposition of criminal incidents requires the preparation of an advance estimate of the number of such incidents that will occur within a given time in a command. Experience indicates that there will be little variance in the overall crime rate between peacetime and wartime. In a theater of operations, a variance will exist between the combat zone and the COMMZ with the bulk of the serious crimes occurring in the latter.

b. Based on extensive statistical data, covering both peacetime and wartime, the average annual crime rate within any command will approximate 37.06 serious crimes per 1,000 military population. This planning factor increases in dependability in direct proportion to the size of the command; and, in a theater of operations, it is best suited for theater-level planning.

c. Crime rate planning factors may be used as the basis for determining the personnel requirements for criminal investigators in a command. Experience shows that one criminal investigator can effectively accomplish an average of 34 criminal investigations per year; therefore, on the average, criminal investigators should be assigned to a command on the basis of one to approximately 1,000 military personnel.

4-31. Military Prisoners

a. *General.* The confinement, care, employment, and disposition of U.S. military prisoners are command responsibilities that planners should remember in preparing for the conduct and support of tactical operations. The number of U.S. military prisoners that must be guarded, processed, employed, evacuated, and restored to duty is of direct interest and application to planners in arriving at requirements for transportation, construction, and personnel. The factors and figures herein, with respect to nonnuclear conditions, are based on extensive statistical data derived from commands of various types and sizes in a wide range of operational environments. These

factors may be applied to a command of any size, but will prove most dependable for theater-level planning. The factors cited for nuclear conditions represent a general increase over the nonnuclear factors, based on the assumption that the employment of nuclear weapons will have an overall demoralizing effect and will create an increased opportunity for crime. Planners must remember that these factors *are not* based on experience and may require extensive alteration in a specific situation.

b. Confinement Rates.

Conditions	Percentage of command population
(1) Nonnuclear.....	1
(2) Nuclear.....	2

c. Evacuation From the Theater of Operations and Retention Therein. The Department of Defense or the Department of the Army establishes basic policies regarding the evacuation of U.S. military prisoners from the theater. These policies may change depending on variations in both the

strategic and the tactical situations. Normally, U.S. military prisoners who are not restorable to duty, who have been sentenced to punitive discharge, or who have more than 6 months to serve are evacuated to CONUS. Of all U.S. military prisoners confined in the theater of operations, the following factors expectedly may apply under both nuclear and nonnuclear conditions when normal evacuation policies have been established:

Nuclear and nonnuclear conditions	Percentage
(1) Evacuated to CONUS disciplinary barracks.....	34
(2) Retained in theater rehabilitation training centers.....	30
(3) Retained in stockades in the theater.....	36

d. Restoration Rates. For planning purposes, the following factors regarding the restoration of U.S. military prisoners to duty may generally apply:

Restoration rates	Percentage
(1) From stockades.....	100
(2) From rehabilitation training centers.....	39
(3) From disciplinary barracks.....	7.7

Section V. PERSONNEL SERVICES

4-32. Decorations

Table 4-23 contains decoration data per 10,000 troops for a month.

4-33. Mail

Table 4-24 pertains to mail per 10,000 troops per month. Table 4-25 (colm 3-5) pertains to mail per 1,000 troops per month.

4-34. Chaplain Planning Factors

a. When chaplain coverage is provided for a force, personnel planning factors are as follows:

- (1) Chaplain positions are authorized for units of the field army in the ratio of 1 for 700 troops or major fraction thereof.
- (2) Chaplain positions are authorized all other units in the ratio of 1 for 850 troops or major fraction thereof.
- (3) Above authorizations exclude chaplain positions for hospitals and convalescent centers. Planning factors for medical units are contained in AR 310-32.
- (4) One primary duty chaplain assistant position is authorized each chaplain position. Additional administrative chaplain assistant positions at staff levels above battalion are authorized by TOE and tables of distribution and allowance (TDA).

Table 4-23. Decoration Data

1		2
1	Decoration	Approximate average
2	Distinguished Service Cross.....	9
3	Distinguished Service Medal.....	1
4	Silver Star.....	103
5	Legion of Merit.....	20
6	Distinguished Flying Cross.....	6
7	Soldier's Medal.....	7
8	Bronze Star Medal.....	565
	Heroism.....	(270)
	Meritorious Achievement.....	(295)
9	Air Medal.....	255
10	Meritorious Service Medal.....	
11	Commendation Medal.....	485
12	Purple Heart.....	1,175

(5) Additional details on planning factors are found in AR 611-101, AR 611-201, and FM 16-5.

b. Chaplain equipment and supply authorizations are based on appropriate TOE's and TA 50-922 and TA 50-989. Chaplain ecclesiastical equipment and supply are classified as expendable and nonexpendable.

(1) Nonexpendable ecclesiastical items mainly consist of line items authorized in appropriate TOE's as well as items of individual issue in the possession of chaplains. These items normally are carried with the unit chaplain.

(2) The theater or force commander may authorize other nonexpendable ecclesiastical items based on TA 50-922. Authorization depends on

Table 4-24. Mail Data

1	2	3	4
Conditions	Pieces	Weight in pounds	MTON of shipping space
<i>Surface:</i>			
<i>Wartime</i>			
Incoming (to the theater)—			
2 Third- and fourth-class mail.....	26,650	49,754	155.481
Outgoing—			
3 Third- and fourth-class mail.....	1,436	2,675	8.328
<i>Air:</i>			
Incoming—			
4 Airmail.....	265,083	6,165	17.614
5 First-class mail.....	97,450	2,256	6.429
Outgoing—			
6 Airmail.....	205,549	4,757	13.591
7 First-class mail.....	54,973	1,270	3.629
<i>Surface:</i>			
<i>Peacetime</i>			
8 First-class mail.....	199,010	5,763	16.466
9 Other.....	10,910	43,453	135.791
Outgoing—			
10 First-class mail.....	52,250	1,075	3.071
11 Other.....	12,480	47,926	149.769
<i>Air:</i>			
Incoming—			
12 Airmail.....	148,183	4,306	12.303
13 First-class mail.....	82,830	3,765	10.757
14 Parcel post.....	870	3,187	9.959
Outgoing—			
15 Airmail.....	261,018	5,118	14.623
16 First-class mail.....	47,234	1,243	3.551
17 Parcel post.....	975	3,656	11.425

Table 4-25. Postal Services

1	2	3	4	5
Item	Lb/man/day	STON/1,000 men/mo	MTON/1,000 men/mo	Sacks or pouches of mail/1,000 men/mo
2 Letter mail ^a	0.028	0.421	2.41 ^b	24.0 ^c
3 Parcel post ^d	0.166	2.490	15.56 ^e	-----
4 Postal supplies.....	0.011	0.171	0.60 ^f	-----
5 Total postal.....	0.205	3.082	18.57	124.5 ^g

^a Moved by air.^b Computed at 10 pouches/MTON (estimated).^c Computed at 185 lb/pouch of mail (estimated).^d Volume may be expected to increase 2.3 times during October and November because of Christmas mail.^e Computed at 8 sacks/MTON (estimated).^f Conversion factor 3.5 MTON/STON (estimated).^g Computed at 40 lb/sack of mail (estimated).

such factors as the mission of the combat forces, their relative stability and degree of combat activity, the types of personnel (to include PW and civilian internees) to receive chaplain support, and the degree of permanent or semipermanent chapel construction authorized or the religious facilities available.

(3) Expendable items of ecclesiastical supply are provided in accordance with the number of

chaplains and auxiliary chaplains authorized and the number of religious services conducted (to include services conducted for PW's and civilian internees). Authorized peacetime allowances are contained in TA 50-980. Whether some of these items may be locally procured depends on the geographic area. Table 4-26 lists certain expendable ecclesiastical supplies essential in an active theater.

Table 4-26. *Combat-Essential Expendable Ecclesiastical Supplies*

1	2	3	4	5	6
Item	Unit	Pounds	STON	Allowances ¹	Basis of issue
2 Candles, altar, 100-percent beeswax, 24/box, 8/pound.....	Box	3.0	0.0015	2.0	Per chaplain per quarter
3 Fair linen, altar, white cloth, 42 in. long, 14 in. wide.....	Each	(³)	(³)	2.0	As required per chaplain
4 Host, Communion, 1½ in. diam, 125/package, 4 package/box.....	Box	0.5	(³)	(⁴)	1 Host per communicant
5 Host, Communion, 2½ in. diam, 25/package.....	Package	0.1	(³)	(⁴)	As required per using chaplain
6 Hymnbook, song and service, hard cover, 6¾ in. long, 4⅞ in. wide.....	Each	0.25	(³)	0.5	Per military person in field unit
7 Religious literature, miscellaneous.....	Package	50.0	0.025	(⁵)	Per chaplain per quarter
8 Supplies, kosher, perishable ²	Case	30.0	0.015	(⁵)	Per Jewish chaplain per month
9 Juice, grape, sacramental use, 24-pt bottles or cans/case.....	Case	36.0	0.018	(⁴)	1 bottle or can per 75 communicants
10 Wine, angelica, white, 12 ⅓-gal bottles/case.....	Case	36.0	0.018	1.0	Per chaplain per quarter
11 Wine, kosher, red, 12 ⅓-gal bottles/case.....	Case	38.0	0.019	1.0	Per 24 Jewish personnel/Passover/Seder. Plus per Jewish chaplain per quarter

¹ To these allowances must be added a percentage for breakage, pilferage, spoilage. This percentage will vary depending on climate, type of handling, and shipping and supply security.

² Transported by air from nearest source of procurement.

³ Negligible.

⁴ As required.

⁵ Not available.

4-35. Legal Services

a. For planning, the workloads indicated in tables 4-27 and 4-28 may be expected in overseas theaters during hostilities. Actual workloads may vary depending on the theater, duration of hostilities, and forces in the theater.

b. Judge Advocate General (JAG) service organization detachments (teams) (TOE 27-500) are theater army troops that may be employed to augment JAG sections when needed.

Table 4-27. Legal Services Planning Factors—Workload Per 10,000 Men

1	2	3	4	5
Area of responsibility	GCM per month	Claims per month	War crimes incidents per month	Legal assistance matters per month
2 Combat zone.....	4	25	15	50-75
3 Communications zone.....	6	150	10	100-150

Table 4-28. JAG Detachment Workloads

1	2
Unit ¹	Work unit per month
2 JAG claims svc team FA.....	40-50 claims.
3 JAG war crimes team GA.....	10-15 incidents.
4 JAG GCM trial team HA.....	10-15 GCM.
5 JAG GCM trial team HB.....	20-25 GCM.
6 JAG legal asst team IA.....	250-300 cases.
7 JAG procurement law teams ²	

¹ For capabilities, assignment, strength, basis of allocation, etc., of the teams listed in this table, see TOE 27-500.

² See TOE 27-500.

Section VI. CIVIL AFFAIRS

4-36. Combat Zone Operations

Civil affairs units initiate actions in an area when it comes under control of friendly military forces. In forward areas, civil affairs activities support tactical operations. When the situation becomes static, civil affairs priorities change from restoration of public order and safety, control of refugees and displaced persons, and emergency relief to public works, transportation, and utilities.

4-37. Displaced Persons and Refugees

a. *General.* Effective control of the movement of civilians is of primary importance. Disorganized masses seriously impair the movement of military units, endanger security, and threaten the health of the military force. To prevent interference with military operations from the movement of the local populace, planners must consider the care, control, and disposition of displaced persons, evacuees, and refugees.

b. *Definitions.*

(1) *Displaced person*—A civilian who is involuntarily outside the national boundaries of his country.

(2) *Evacuees*—Civilians, either residents or transients, who have been ordered to move by the authorities of a friendly nation and whose movement and accommodation are planned and controlled by such authorities.

(3) *Refugee*—A civilian, who by reason of real or imagined danger, has left his home to seek safety elsewhere.

c. *Planning.* Detailed planning for the care and control of refugees, evacuees, and displaced persons should include such matters as—

(1) The authorized extent of migration and evacuation.

(2) Location and establishment of camps.

(3) Standards of care.

(4) Status and ultimate disposition of refugees and displaced persons from allied, neutral, or enemy countries.

(5) Extent of local government authority over nonnational civilians.

(6) Designation of routes for refugee movement.

(7) Military and civilian police to provide traffic control.

(8) Intelligence detachments to screen personnel.

(9) Civil affairs units to supervise camp operations.

d. *Evacuation.* When possible, the rearward evacuation of communities in forward areas should be avoided. Evacuation removes civilians from areas where they can maintain themselves; provides material for enemy propaganda; arouses resentment; complicates the control of their move-

ments; increases the difficulties of maintaining adequate security; necessitates the use of military transport and the expenditure of additional food, fuel, clothing, and medical supplies; and creates epidemic conditions and decreases availability of facilities to support military operations.

e. Evacuation Planning. The number of civilians that must be evacuated in specific situations may vary greatly. Planners may, however, develop workable estimates using the factors listed below:

(1) *Transportation.* Use civilian transportation where available.

(2) *Distance.* Move only the minimum distance.

(3) *Fallout.* Avoid possible fallout areas.

(4) *Screening.* Screen and document evacuees as soon as possible.

(5) *Identification.* Provide each evacuee with an identification card.

(6) *Briefing.* Tell the evacuees why they are being moved.

(7) *Impedimenta.* Determine the amount each person is allowed to take.

(8) *Rations.* Issue rations for a short move at the time of departure or en route.

(9) *Priority.* Determine categories and timing of evacuations from the mission.

(10) *Assembly areas and camps.* Use existing civilian facilities to the maximum.

(11) *Medical care.* Use civilian personnel where available.

(12) *Religious needs.* Where possible, make available the required religious facilities.

(13) *Duration.* Return evacuees as soon as possible.

(14) *Return.* Include return plans in the evacuation plan. FM 41-10 contains additional information.

CHAPTER 5

COMBAT SERVICE SUPPORT—SUPPLY (STANAG 2115)

Section I. SUPPLY

5-1. General

a. Combat Service Support. Combat service support is the assistance provided operating forces primarily in the fields of administrative services, chaplain service, civil affairs, finance, legal service, maintenance, medical service, replacements, supply, transportation, and other logistic services. Units providing combat service support at DS/GS levels are described in various chapters, as follows:

- (1) Ammunition service (para 5-10 and 5-11).
- (2) Army Medical Service (AMEDS) (para 4-24).
- (3) Engineer support (para 2-20 and 7-17).
- (4) Maintenance service (para 7-1).
- (5) Supply (para 5-41).
- (6) Transportation service (chap 6).

b. Coordination.

(1) Close coordination between combat and combat service support planning is essential. Combat service support may decisively influence combat operations.

(2) Planning for combat and combat service support is a concurrent action. Combat service support planners must have information sufficiently in advance of a combat operation to arrange for combat service support. This information consists of strategic and tactical planning data needed for the preparation of practicable plans.

c. Supply. A major portion of the combat service support function concerns the procurement, distribution, and maintenance of all items necessary for the equipment, maintenance, and operation of a military command including food, clothing, equipment, arms, ammunition, fuel, forage, materials, and machinery of all kinds.

d. Fundamentals of Supply.

(1) Supply must be responsive in detail, rapid in action, and simple in operation. It must be adjustable to requirements of supported units and capable of satisfying fluctuating demands.

(2) The organization for supply encompasses —

(a) A system for stocking during peacetime for wartime requirements of combat-essential items to insure an automatic supply capability to sustain operations pending the es-

tablishment of wartime supply procedures or the reestablishment of normal peacetime supply channels. Theater commanders and the Commanding General, U.S. Continental Army Command (USCONARC) specify these combat-essential items in accordance with AR 11-8.

(b) Personnel and facilities to receive, store, maintain, and distribute or issue supplies and equipment.

(c) An action agency at each echelon of supply distribution that responds to requirements by directing issue, calling supplies forward for delivery to user, or placing demands on the higher echelon for action, whichever is most appropriate.

(d) Personnel to plan the supply operation and coordinate or supervise its execution; assign supply missions; and recommend or enforce policies, allocations, and priorities.

(3) The supply operation recognizes the potential of automatic data processing equipment (ADPE). It uses ADPE, together with an effective communications system, to compile and transmit supply data and process management information. Additionally, the supply operation includes —

(a) A responsive requisitioning system.

(b) An inventory control (or supply management) system capable of providing current information on the amount, location, and condition of stocks on hand; of balancing current and anticipated requirements against known assets; and of judiciously disposing of excess stocks.

(c) Supply on a functional basis in both the field army and the communications zone (COMMZ).

(d) Close coordination and exchange of information with continental United States (CONUS) support systems and provision for the transition from a peacetime environment to a wartime posture.

(e) Designation or categorization of mission to relate supply to other combat service support operations and to facilitate assignment of supply responsibilities to specific levels of command. These designations are —

1. Direct support (DS) supply, which is the supply support provided to using troops and units. In theaters of operations, DS supply is essentially customer-oriented and retail in nature.

2. General support (GS) supply, which is the supply support provided to the DS system. GS is essentially commodity-oriented and whole-sale in nature.

5-2. Ten Classes of Supply

The current 10 classes of supply are listed in table 5-1. Whenever comparisons are made to the obsolete five classes of supply existing at the time of World War II and the Korean War, classes I,

III, and V are comparable; the obsolete classes II and IV compare to the current classes II, IV, and VI through X, taking into consideration that classes VI and X may lack data entirely. The obsolete classes V and V(A) compare to the current classes V(W) and V(A) respectively. Obsolete classes III and III(A) compare to the current classes III(W) and III(A) respectively; however, Air Force requirements are not considered as they were for the Army Air Force in World War II. (See also notes to table 5-1.)

Table 5-1. Ten Classes of Supply

1		2
Major classification		Subclassification ¹
2	I—Subsistence	A—Air (in-flight rations). R—Refrigerated subsistence. S—Nonrefrigerated subsistence (less combat rations). C—Combat rations. ²
3	II—Clothing, individual equipment, tentage, organizational tool sets and tool kits, hand tools, and administrative and housekeeping supplies and equipment.	B—Ground support material. ³ E—General supplies. F—Clothing and textiles. M—Weapons. T—Industrial supplies. ⁴
4	III—POL: petroleum fuels; lubricants; hydraulic and insulating oils; preservatives; liquid and compressed gases; bulk chemical products; coolants; deicing and antifreeze compounds, together with components and additives of such products; and coal.	A—Air. W—Ground (surface).
5	IV—Construction: construction materials, to include installed equipment and all fortification/barrier materials.	-----
6	V—Ammunition: ammunition of all types (including CBR and special weapons), bombs, explosives, mines, fuzes, detonators, pyrotechnics, missiles, rockets, propellants, and other associated items.	A—Air. W—Ground.
7	VI—Personal-demand items (non-military sales items).	-----
8	VII—Major end items: a final combination of end products that are ready for their intended use, e.g., tanks, launchers, mobile machine shops, and vehicles.	A—Air. B—Ground support material. ³ D—Commercial-design vehicles. G—Electronics. K—Tactical vehicles. L—Missiles. M—Weapons. N—Special weapons.
9	VIII—Medical materiel, including medical-peculiar repair parts.	-----
10	IX—Repair parts (less medical-peculiar repair parts): all repair parts and components, to include kits, assemblies, and subassemblies, repairable and nonrepairable, required for maintenance support of all equipment.	A—Air. B—Ground support materiel. ³ D—Commercial-design vehicles. G—Electronics. K—Tactical vehicles. L—Missiles. M—Weapons. N—Special weapons. T—Industrial supplies. ⁴
11	X—Materiel to support nonmilitary programs, e.g., agricultural and economic development not included in classes I through IX.	

¹The ALPHA code for subclassification of classes II, VII, and IX represents materiel category designators used in supply management, with the exception of A (Air), which is used throughout all classes of supply as applicable. ALPHA codes not used as materiel category designators have been assigned to the subclassifications for classes I, III, and V. The subclassification materiel designators (A through W) may be used in combination with the designated subclassifications, when appropriate and if desired, to definitize further a portion of supply for planning purposes, e.g., use of class V AL to designate ammunition, air missile. Additional codes may be used by the Services to satisfy a specific requirement, e.g., to designate repairable or nonrepairable, high-dollar items, or for other selective management purposes. This additional permissive coding is not to be used in lieu of that designated for the major classification and subclassifications.

²Includes gratuitous health and welfare items.

³Includes power generators and construction, barrier, bridging, firefighting, petroleum, and mapping equipment.

⁴Includes bearings, block and tackle, cable, chain, wire rope, screws, bolts, studs, steel rods, plates, and bars.

Section II. CLASSES I AND III SUPPLY**5-3. Characteristics of Class I**

Table 5-2 gives characteristics of standard rations and table 5-3 gives time elements. While the figures in table 5-3 are an average for combat

conditions, they should be used only in lieu of actual experience. See FM 10-60 for further details.

Table 5-2. Characteristics of Standard Rations

1	2	3	4	5	6	7
Item	Number of units per case	Gross weight per case (lb)	Volume per case (cu ft)	Average weight per unit including packing (lb)	Average calories per unit	Remarks
2 Field ration A.....	(*).....	(*)	(*)	6.0	4,600 per ration.	This basic field ration consists of such perishables as fresh and frozen meats, vegetables, and fruits. Its primary use is for stable conditions and static phases of military operations when normal cooking and refrigeration facilities are available. It should be issued in preference to any other type of ration whenever it is available and circumstances permit its use.
3 Standard B ration for Armed Forces.	(b).....	(b)	(b)	6.0	4,400 per ration.	Same as the field ration, with nonperishables substituted for perishables. Designed for use where refrigeration facilities are lacking or impracticable but where kitchen and cooking facilities are available. (See SB 10-495.)
4 Meal, combat, individual.	12 meals...	25	0.83	1.63	1,200 per meal.	Designed for use as individual meal packets or in multiples of 3 for a complete ration. Not to be used over extended periods.
5 Food packet, Long-range patrol.	24.....	29	0.87	0.69	1000+ per packet.	Issued to troops under combat conditions where resupply may be uncertain for as long as 10 days. Because the packet is designed for individual use, it is suitable for tactical messing, which requires dispersion. Water, preferably hot, is required to reconstitute the dehydrated components of the packet. Eight different menus are available. This packet has been classified as limited-production type.
6 Food packet, survival, general-purpose.	24 packets	20	0.43	0.75	880 per packet.	Contains 4 food bars, sugar, instant coffee, and soup and gravy bases packed in a rectangular can with a key opener taped thereto. Minimal recommended issue is 1/2 packet per man per day in hot climates and 1 packet per man per day in cold climates.
7 Ration, trail, frigid individual.	8 rations...	34	1.28	4.0	4,400 per ration.	Designed for use in extremely cold climates by small patrols or trail teams for short periods (1-3 days) when resupply is impossible.
8 Ration supplement, sundries pack (1 pack per 100 men).	1.....	47	1.75	-----	-----	Composed of items necessary to the health and comfort of troops, e.g., essential toilet articles, tobacco, and confections that normally are obtained at an exchange. Made available in theaters of operations for issue pending establishment of adequate service facilities.
9 Ration supplement, aid station (makes 100 8-oz drinks).	1.....	16	1.01	-----	-----	Designed for use at forward medical aid stations to provide combat casualties with hot, stimulating beverages, which alleviate shock and contribute to patient comfort.

^a Warehouse storage space per 100 rations (based on 8-ft stack height and including allowances for aisles) is 22 cu ft refrigerated storage; 45 cu ft covered storage; and 33 cu ft open storage.

^b Warehouse storage space per 100 rations (based on 8-ft stack height and including allowances for aisles) is 26 cu ft covered storage and 40 cu ft open storage.

Table 5-3. Time Elements in Class I Supply

1	Work	2	3
		Daylight (min)	Dark (min)
2	Unloading of rations for 1 division at class I distribution point and preparing to distribute to battalions or units of similar size.	120	150
3	Distribution of class I supplies to battalion or unit of similar size by higher echelon at one distribution point.	30	30
4	Distribution of class I supplies to separate battalion or unit of similar size by higher echelon	15	15
5	Preparation of 1 day's class I supplies for issue at battalion class I distribution point	30	60
6	Physical distribution by battalion of 1 day's class I supplies (transfer of loads) to kitchen	15	20
7	Unloading of kitchen equipment from trucks, setting up, and being prepared to begin cooking (or vice versa).	20	20
8	Breakdown of subsistence into 3 meals at kitchen (breakdown accomplished by mess personnel)	15	20
9	Personnel to prepare, cook, and be ready to serve a hot meal, starting with a hot kitchen	120	150
10	Kitchens to prepare a cold noon meal	60	90
11	Serving a hot meal to troops from a kitchen truck with majority of men being served at the truck ..	45	60
12	Serving a hot meal to troops by carrying parties (when kitchen is located within a 900-meter radius of company).	90	120

5-4. Class III Supply

The data contained in the following tables should be used in estimating petroleum, oil, and lubricants (POL) requirements. Consumption factors for class III (para 5-26) in pounds per man per day are based on these consumption factors, among others.

Equipment	Basis	Table number
Army aircraft	1 cruise hour	5-4
Vehicles, weapons, and vehicular equipment ..	1 km on solid, dry, level roads	5-5
Construction equipment	1 hour normal operating time	5-6
Power units	1 hour normal operating time	5-7
Marine equipment	1 hour normal operating time	5-8
Other equipment	1 hour normal operating time	5-9
Bulk petroleum capacities		5-10

Table 5-4. Army Aircraft—Fuel and Lubricant Data

1	LIN	Nomenclature	Type	Fuel		Engine oil	
				Internal fuel cap gal	Consumption per cruise hr/gal	Type	Consumption per 100 hr/gal
2	A30111	Airplane, obsn, O-1D	AVGAS	42	9.00	II	7.2
3	A30221	Airplane, obsn, STOL, OV-1B	Jet	297	126.00	Turbine	1.0
4	A30271	Airplane, obsn, STOL, OV-1C	Jet	297	126.00	Turbine	1.0
5	A30321	Airplane, obsn, tnr, TO-1A	AVGAS	42	8.00	II	7.2
6	A30621	Airplane, util, U-1A	AVGAS	213	31.00	II	54.7
7	A30671	Airplane, util, U-6A	AVGAS	138	19.00	II	17.5
8	A30721	Airplane, util, U-8D	AVGAS	230	31.00	II	30.0
9	A30821	Airplane, util, U-8F	AVGAS	230	30.00	II	30.0
10	A30971	Airplane, util, STOL, U-10A	AVGAS	60	17.00	II	11.0
11	K29660	Hel, atk, AH-1G	Jet	248	63.00	Turbine	4.0
12	K29728	Hel, atk, AH-56A	Jet	438	225.00	Turbine	40.0
13	K29797	Hel, basic inst tnr, TH-13T	AVGAS	57	21.00	II	25.0
14	K30097	Hel, cgo-trans, CH-21C	AVGAS	300	77.00	II	55.0
15	K30234	Hel, cgo-trans, CH-34A	AVGAS	262	97.00	II	129.0
16	K30254	Hel, cgo-trans, CH-34C	AVGAS	262	97.00	II	129.0
17	K30378	Hel, cgo-trans, CH-47A	Jet	630	350.00	Turbine	143.0
18	K30383	Hel, cgo-trans, CH-47B	Jet	630	350.00	Turbine	143.0
19	K30645	Hel, obsn, OH-6A	Jet	62	23.00	Turbine	0.1
20	K30682	Hel, obsn, OH-13E	AVGAS	29	16.00	II	1.3
21	K30702	Hel, obsn, OH-13G	AVGAS	42	10.00	II	7.0
22	K30719	Hel, obsn, OH-13H	AVGAS	42	13.00	II	7.0
23	K30746	Hel, obsn, OH-13S	AVGAS	57	15.00	II	7.0
24	K30917	Hel, obsn, OH-23D	AVGAS	48	16.00	II	12.0
25	K30961	Hel, obsn, OH-23G	AVGAS	46	19.00	II	12.0
26	K31749	Hel, util, UH-1B	Jet	165	60.00	Turbine	4.0
27	K31786	Hel, util, UH-1D	Jet	224	63.00	Turbine	4.0

Table 5-5. Vehicles, Weapons, and Vehicular Equipment—Fuel and Lube Data

1	LIN	Nomenclature	Type of fuel	Fuel cap gal	Gal/km	Oil consumption gal/100 km	Gear lube lb/100 km	Greases lb/100 km
2	D10725	Carr, 81-mm mort FTRAC (less mort)	Diesel	136.5	.25	1.30	NA	1.30
3	D10740	Carr, 107-mm mort, SP (less mort)	Diesel	136.5	1.56	1.30	NA	1.30
4	D10990	Carr, cgo, amph	Gas	65.0	.16	NA	NA	NA
5	D11048	Carr, cgo, tracked, 6-ton	Multifuel	105.0	1.66	NA	NA	NA
6	D11401	Carr, comd and recon, armd	Gas	110.0	.50	NA	NA	NA
7	D11538	Carr, CP, lt tracked	Multifuel	120.0	1.56	NA	NA	NA
8	D12086	Carr, pers, FTRAC, armd	Gas	80.0	1.65	NA	NA	NA
9	E56577	Cbt engr veh, FTRAC	Diesel	375.0	2.18	NA	NA	NA
10	J96819	Gun, antiaircraft arty, SP, 40-mm	Gas	144.0	1.75	NA	NA	NA
11	J96956	Gun, at, SP, 90-mm	Gas	55.0	.93	NA	NA	NA
12	J97230	Gun, FA, SP, 175-mm	Multifuel	300.0	2.00	NA	NA	NA
13	K56981	How, hv, SP, 8-in	Multifuel	300.0	1.87	2.50	1.10	1.80

Table 5-5—Continued

1	2	3	4	5	6	7	8
LIN	Nomenclature	Type of fuel	Fuel cap gal	Gal/km	Oil consumption gal/100 km	Gear lube lb/100 km	Greases lb/100 km
14	K57255 How, lt, SP, 105-mm	Multifuel	135.0	1.93	2.40	.90	1.60
15	K57666 How, mdm, SP, 155-mm	Multifuel	135.0	1.64	2.40	.90	1.60
16	K90188 Inst rep shop, trk-mtd, 2½-ton, 6x6, with equip	Gas	50.0	.09	.30	.50	.30
17	R50543 Recov veh, FTRAC, lt, armd	Multifuel	320.0	1.90	NA	NA	NA
18	R50680 Recov veh, FTRAC, mdm	Gas	445.0	2.81	NA	NA	NA
19	R50817 Recov veh, FTRAC, hv	Gas	400.0	1.63	NA	NA	NA
20	V12826 Tk, cbt, FTRAC, 76-mm	Gas	140.0	.49	23.0	.90	.90
21	V12963 Tk, cbt, FTRAC, 90-mm	Gas	335.0	.21	NA	NA	NA
22	V13100 Tk, Cbt, FTRAC, 105-mm	Diesel	375.0	1.62	3.20	1.30	.60
23	V13237 Tk, cbt, FTRAC, 120-mm	Gas	268.0	2.62	NA	NA	NA
24	V13374 Tk, Cbt, FTRAC, flamethrower	Diesel	335.0	.51	NA	NA	NA
25	X38639 Trk, amb, ¼-ton, 4x4, with equip	Gas	20.0	.03	.20	.10	.10
26	X38776 Trk, Amb, ¾-ton, 4x4, with equip	Gas	24.0	.06	.10	.20	.20
27	X39735 Trk, cgo, ¾-ton, 4x4, with equip	Gas	24.0	.06	.10	.20	.20
28	X40009 Trk, cgo, 2½-ton, 6x6, with equip	Gas	50.0	.09	.30	.50	.30
29	X40557 Trk, cgo, 2½-ton, 6x6, XLWB, with acq ant, trans kit, with equip	Gas	50.0	.13	NA	NA	NA
30	X40831 Trk, cgo, 5-ton, 6x6, LWB, with equip	Gas	78.0	.14	.50	.30	.30
31	X41790 Trk, cgo, 10-ton, 6x6, WWN, with equip	Gas	220.0	.20	.50	.30	.30
32	X43228 Trk, dump, ¾-ton, 4x4, with equip	Gas	24.0	.06	.10	.20	.20
33	X43297 Trk, dump, 2½-ton, 6x6, with equip	Gas	50.0	.09	.30	.50	.30
34	X43845 Trk, dump, 5-ton, 6x6, WWN, with equip	Gas	110.0	.14	.50	.30	.30
35	X53709 Trk, maint, tel, ¾-ton, 4x4, WWN, with equip	Gas	24.0	.06	NA	NA	NA
36	X53983 Trk, maint, earth-borer, pole-setter, 2½-ton, 6x6, WWN, with equip	Gas	50.0	.13	NA	NA	NA
37	X55627 Trk, platform, util, ½-ton, 4x4, with equip	Gas	8.0	.04	.10	.10	.10
38	X56586 Trk, stake, 5-ton, 6x6, WWN, with equip	Diesel	78.0	.11	.50	.30	.30
39	X57271 Trk, tk, fuel-svc, 2½-ton, 6x6, with equip	Gas	50.0	.09	.30	.50	.30
40	X58367 Trk, tk, water, 1,000-gal, 2½-ton, 6x6, with equip	Gas	50.0	.09	NA	NA	NA
41	X59189 Trk, trac, 2½-ton, 6x6, WWN, with equip	Multifuel	50.0	.09	.30	.50	.30
42	X59463 Trk, trac, 5-ton, 6x6, WWN, with equip	Diesel	110.0	.11	.40	.60	.50
43	X59600 Trk, trac, 10-ton, 6x6, with dual midship winch, with high-mtd 5th whl, with equip	Gas	166.0	.34	.50	.50	.60
44	X59874 Trk, trac, 10-ton, 6x6, with midship winch, with low-mtd 5th whl, with equip	Multifuel	166.0	.14	NA	NA	NA
45	X60696 Trk, trac, wkr, 5-ton, 6x6, WWN, with equip	Gas	78.0	.14	.30	.50	.30
46	X60833 Trk, util, ¼-ton, 4x4, with equip	Gas	17.0	.03	.10	.10	.10
47	X61929 Trk, van, expansible, 2½-ton, 6x, with equip	Gas	50.0	.09	.30	.50	.30
48	X62340 Trk, van, shop, 2½-ton, 6x6, with equip	Gas	50.0	.09	.30	.50	.30
49	X63025 Trk, wkr, crane, 2½-ton, 6x6, WWN, with equip	Gas	50.0	.13	.30	.50	.30
50	X63094 Trk, wkr, ¾-ton, 4x4, with equip	Gas	24.0	.06	.10	.20	.20
51	X63162 Trk, wkr, 2½-ton, 6x6, WWN, with equip	Diesel	50.0	.08	.30	.50	.30
52	X63299 Trk, wkr, 5-ton, 6x6, WWN, with equip	Gas	78.0	.14	.50	.30	.30

Table 5-6. Construction Equipment—Fuel Data

1		2	3	4
1	LIN	Nomenclature	Type of fuel	Consumption (gph)
2	E69105	Compressor, recip, pwr-driven, air recip, gas-driven 5-cfm, 175-psi.....	Gas	.33
3	E69242	Compressor, recip, pwr-driven, air recip, gas-driven, 15-cfm, 175-psi.....	Gas	.62
4	E69790	Compressor, recip, pwr-driven, air, skid, gas-driven, 55-cfm, 100-psi.....	Gas	1.27
5	E70064	Compressor, recip, pwr-driven, trk, 2-whl, pneu tires, gas-driven 5-cfm, 175-psi.....	Gas	.29
6	E70201	Compressor, recip, pwr-driven, trk, 2-whl, pneu tires, gas-driven, 8-cfm, 175-psi.....	Gas	.35
7	E70338	Compressor, recip, pwr-driven, trk, 2-whl, pneu tires, gas, 15-cfm, 175-psi.....	Gas	.68
8	E70886	Compressor, recip, pwr-driven, air, whl, gas-driven, 15-cfm, 3,500-psi, winterized.....	Gas	1.23
9	E71434	Compressor, recip, pwr-driven, air, trk, gas-driven, winterized, 80-cfm, 5,000-psi.....	Gas	9.99
10	E72393	Compressor, rot, pwr-driven, air, skid, gas-driven, 125-cfm, 100-psi.....	Gas	3.22
11	E73352	Compressor, rot, pwr-driven, air, whl-mtd, diesel-driven, 600-cfm 100-psi.....	Diesel	7.00
12	E73489	Compressor, rot, pwr-driven, air, trk, gas, 210-cfm, 100-psi.....	Diesel	5.25
13	E73626	Compressor, rot, pwr-driven, air, wheelbarrow frame, 2 pneu tires, gas-driven, 60-cfm, 6.5-psi.....	Gas	.62
14	F39241	Crane-shovel, whl-mtd, 5-ton, $\frac{3}{8}$ -cu yd, diesel, 4x4, rough terrain, air-trans.....	Diesel	3.50
15	F39378	Crane-shovel, whl-mtd, 20-ton, $\frac{3}{4}$ -cu yd, rough terrain.....	Diesel	3.50
16	F40474	Crane-shovel, basic unit, crawler-mtd, 40-ton, 2-cu yd.....	Diesel	8.20
17	F43077	Crane-shovel, whl-mtd, 7-ton, with boom crane, 24-ft, block and tackle, 9-ft.....	Gas	2.75
18	F43414	Crane-shovel, trk-mtd, 20-ton, $\frac{3}{4}$ -cu yd, with block and tackle, 20-ton boom crane, 30-ft.....	Gas	4.00
19	F49399	Crushing and screening plant, diesel- and elec-driven, whl-mtd, 75-tph (Army).....	Diesel	7.40
20	F50995	Crusher, jaw, gas-driven, whl-mtd, 15-tph.....	Gas	4.80
21	G29945	Ditching mach, diesel-driven, whl-mtd, ladder.....	Diesel	4.50
22	G58563	Drilling mach, well, percussion, skid-mtd, gas, 6-in diam hole at 1,000 ft.....	Gas	2.75
23	J74715	Grader, rd, mtg, diesel-driven, air-trans, 6x4.....	Diesel	4.50
24	J74852	Grader, rd, mtg, diesel-driven, hv, 6x4 front-whl sheering.....	Diesel	5.60
25	K04560	Hammer, pile-drv, drop, 3,000-lb.....	Diesel	1.50
26	K04697	Hammer, pile-drv, self-powered, diesel-driven, 7,500-ft lb.....	Diesel	2.50
27	K04834	Hammer, pile-drv, self-powered, diesel-driven, 22,400-ft lb.....	Diesel	7.00
28	L21437	Kettle, heating, bitumen, gas-driven, tk-mtd, 165-gal.....	Gas	1.25
29	L76351	Loader, scoop-type, diesel-driven, 4-whl, 1 $\frac{1}{2}$ cu yd.....	Diesel	4.00
30	M54151	Mixer, concrete, tk-mtd, gas-driven, 16 cu ft.....	Gas	1.25
31	N75124	Paving mach, bituminous mat, gas-driven, crawler-mtd, 12-ft rg.....	Gas	2.75
32	N91371	Pile-driving rig, skid-mtd, 65-ft lg.....	Gas	4.50
33	S11068	Roller, mtg, gas-driven, tandem, 2 rolls, 5-8-ton.....	Gas	2.75
34	S11616	Roller, mtg, gas, 3-whl, 10-ton, with sprinkler.....	Gas	3.75
35	W77364	Trac, FTRAC, low-spd, diesel, hv, dbp, with bulldozer, scarifier.....	Diesel	8.20
36	W80515	Trac, FTRAC, low-spd, diesel, lg, dbp, with bulldozer, scarifier.....	Diesel	4.30
37	W80789	Trac, FTRAC, low-spd, diesel, med, with angledozer, scarifier.....	Diesel	7.30
38	W83529	Trac, FTRAC, low-spd, diesel, med dbp, with bulldozer, with scarifier ripper.....	Diesel	9.99

Table 5-7. Generator Fuel Data

1	2	3	4
LIN	Nomenclature	Type of fuel	Consumption (gph)
2	J35424 Genr set, diesel-eng, tlr-mtd, 15-kw, 60-cy, 3-ph, ac, 120/208—240/416-v, PU-402/M	Diesel	3.50
3	J35561 Genr set, diesel-eng, tlr-mtd, 45-kw, 60-cy, 3-ph, ac, 120/208—240/416-v, PU-407/M	Diesel	5.00
4	J35698 Genr set, diesel-eng, trk-mtd, 45-kw, 60-cy, 3-ph, ac, 120-208—240/416-v, PU-408/M	Diesel	5.00
5	J35835 Genr set, diesel-eng, 15-kw, 60-cy, 3-ph, ac, 120/208—240/416-v, skid	Diesel	3.50
6	J35913 Genr set, diesel-eng, 15-kw, 60-cy, 1-ph, 120/240-v, 12.5-kw, 50-cy, 240/416-v, skid	Diesel	3.50
7	J36109 Genr set, diesel-eng, 30-kw, 60-cy, 3-ph, ac, 120/208—240/416-v, 50-cy, skid	Diesel	4.20
8	J36931 Genr set, diesel-eng, 45-kw, 60-cy, 3-ph, ac, 120/208—240/416-v, 50-cy, precise pwr	Diesel	5.00
9	J37342 Genr set, diesel-eng, 45-kw, 400-cy, 3-ph, ac, 120/208—240/416-v, skid	Diesel	5.00
10	J38301 Genr set, diesel-eng, 60-kw, 60-cy, 3-ph, ac, 120/208—240/416-v, 50-cy, skid	Diesel	6.00
11	J38712 Genr set, diesel-eng, 100-kw, 60-cy, 3-ph, ac, 120/208—240/416-v, 50-cy, skid	Diesel	8.00
12	J40767 Genr set, gas-eng, tlr-mtd, PU-236/G	Gas	1.40
13	J40904 Genr set, gas-eng, tlr-mtd, PU-248/U	Gas	2.40
14	J41041 Genr set, gas-eng, tlr-mtd, PU-253/U	Gas	2.40
15	J41109 Genr set, gas-eng, tlr-mtd, PU-269	Gas	2.40
16	J41178 Genr set, gas-eng, tlr-mtd, PU-290/MR	Gas	2.40
17	J41315 Genr set, gas-eng, tlr-mtd, PU-294/G	Gas	1.40
18	J41452 Genr set, gas-eng, tlr-mtd, PU-304/MPQ-4A	Gas	2.40
19	J41589 Genr set, gas-eng, tlr-mtd, PU-322/G	Gas	.74
20	J41786 Genr set, gas-eng, tlr-mtd, PU-332/U	Gas	2.40
21	J41819 Genr set, gas-eng, tlr-mtd, PU-375A/G	Gas	2.40
22	J41863 Genr set, gas-eng, tlr-mtd, PU-378/G	Gas	2.40
23	J41931 Genr set, gas, tlr-mtd, PU-456/G	Gas	1.40
24	J42000 Genr set, gas-eng, tlr-mtd, PU-474/U	Gas	2.40
25	J42274 Genr set, gas-eng, 0.15-kw, 60-cy, 1-ph, ac, 120-v, skid	Gas	.15
26	J42548 Genr set, gas-eng, 0.3-kw, 60-cy, 1-ph, ac, 120/240-v, shock mtd, PE-214/BCD	Gas	.20
27	J42685 Genr set, gas-eng, 0.3-kw, ac, 115-v, 1-ph, 400-cy, dc, 24—35-v	Gas	.20
28	J42822 Genr set, gas-eng, 0.4-kw, ac, 1-ph, 400-cy, 115-v, 0.08-kw, dc, 28-v, shock, PU-422/U	Gas	.21
29	J42959 Genr set, gas-eng, 0.5-kw, 60-cy, 1-ph, ac, 120-v, shock	Gas	.25
30	J43096 Genr set, gas-eng, 0.5-kw, 400-cy, 1- and 3-ph, ac, 120—120/240—120/208-v	Gas	.25
31	J43233 Genr set, gas-eng, 0.5-kw, 2-wire, dc, 28-v, shock	Gas	.25
32	J43918 Genr set, gas-eng, 1.5-kw, 60-cy, 1-ph, 2-wire, ac, 120-v, shock	Gas	.60
33	J44055 Genr set, gas-eng, 1.5-kw, dc, 28-v, shock	Gas	.60
34	J44329 Genr set, gas-eng, 2-kw, dc, 12-v, shock	Gas	.70
35	J45699 Genr set, gas-eng, 3-kw, 60-cy, 1—3-ph, 120/240—120/208-v, skid-shock	Gas	.84
36	J47068 Genr set, gas-eng, 5-kw, 60-cy, 1—3-ph, ac, 120—240—120/208-v, skid-shock-mtd	Gas	1.40
37	J48439 Genr set, gas-eng, 5-kw, ac, 120/208-v, 3-ph, 400-cy, skid-shock-mtd	Gas	1.40
38	J49055 Genr set, gas-eng, 7.5-kw, dc, 28.5-v, whl-mtd	Gas	1.50
39	J49261 Genr set, gas-eng, 10-kw, 400-cy, 1—3-ph, ac, 120—120/208-v, skid	Gas	2.40

Table 5-8. Marine Equipment Fuel Data

1	2	3	4
LIN	Nomenclature	Type of fuel	Consumption (gph)
2	B83582 Bt, brg-erection, inboard-eng, aluminum, gas-driven, 27-ft lg	Gas	15.00
3	B83993 Bt, pax and cgo	Diesel	9.99
4	B84267 Bt, Picket, 52-65-ft	Diesel	31.30
5	F35953 Crane, barge, 60-ton	Diesel	19.70
6	F36090 Crane, barge, 89-250-ton	Diesel	45.50
7	L36602 LCM, 50-56-ft	Diesel	25.00
8	L36739 LCM, 69-ft	Diesel	31.00
9	L36876 LCV, 115-ft	Diesel	38.40
10	X70772 Tug, 200-440-hp	Diesel	10.20
11	X70909 Tug, 600-650-hp	Diesel	39.80
12	X71046 Tug, 1,200-1,530-hp	Diesel	69.70

Table 5-9. Other Equipment Fuel Data

1	2	3	4
LIN	Nomenclature	Type of fuel	Consumption (gph)
2 J30766	Genr and chg plant, acetylene, stlr-mtd, 750-cfh.....	Diesel	2.50
3 K24862	Heater, duct-type, ptbl, gas, 250,000-btu, whl-mtd.....	Gas	2.00
4 K24931	Heater, duct-type, ptbl, 400,000-btu, gas- and elec-driven blower.....	Gas	3.82
5 K26890	Heater, space, coal or oil, 45,000-btu, 18 $\frac{3}{8}$ -in high.....	Diesel	0.90
6 K26275	Heater, space, gas, 60,000-btu.....	Gas	1.00
7 L48315	Ldry unit, tlr-mtd, 30-lb-cap drying tumbler.....	Gas	8.00
8 R65544	Ref unit, mech panel-type, gas-driven.....	Gas	1.50
9 R65818	Ref unit, mech panel-type, gas-driven.....	Gas	1.50

Table 5-10. Bulk Petroleum Capacities

1	2	3
Line item number	Type of carrier/container	Amount carried/contained (gal)
	Barges:	
2 B30786	Har and canal.....	15,000 to 30,000
3 B30923	Coastwise.....	200,000 to 400,000
4 -----	Navy pon.....	84,000
	Pipelines:	
5 -----	4-in.....	304,000 per day
6 -----	6-in.....	655,000 per day
7 -----	8-in.....	1,135,000 per day
	Railroad tk cars, petr:	
8 R03112	Fgn, narrow-gage.....	6,000
9 R03249	Fgn, broad-gage.....	10,000
10 R03523	Dom.....	10,000
	Ships:	
11 -----	Large tanker.....	2.5 to 11 million
12 -----	Small tanker.....	600,000 to 2 million
	Stor tks:	
13 V15292	Collapsible, fabric.....	1,000; 3,000; 10,000; 52,500
14 V15566	Horiz, skid-mtd.....	600
15 V16696	Bolted steel.....	10,500; 42,000; 420,000
16 X23327	Transporter, liq, rolling-wheel-type.....	1,000
17 X57408	Trk, tk, fuel-svc, 2 $\frac{1}{2}$ -ton, 6x6.....	1,200
18 X59463	Trk, trac, 5-ton, 6x6, with stlr, tk, fuel, 12-ton.....	5,000

5-5. Weights and Volumes

Weights, volumes, and conversion factors for petroleum products are contained in table 5-11.

Table 5-11. Weights, Volumes, and Conversion Factors for Petroleum Products

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Product	Packaging	Wt (lb)	Cu ft		Conversion factors		Gal per STON	Gal per LTON	Gal per MTON	Bbl per LTON	Packages per STON	Packages per LTON	Packages per MTON	Cap of veh for carrying filled containers ²		
				Actual	Plan-ning factor	Gal to lb	Lb to gal								1½-ton trk	2½-ton trk	5-ton trk
2	AVGAS	Bulk				5.90	0.169	339.0	379.7		9.04						
		55-gal drums ³	373.0	9.03	11	6.91	0.145	289.4	324.2	187.8		5.36	6.00	3.48	8	14	28
		55-gal drums ⁴	389.0	8.80	11	7.20	0.139	277.8	311.1	192.8		5.14	5.76	3.57	8	13	26
		55-gal drums ⁵	364.0	9.20	11	6.90	0.145	289.9	324.6	181.2		5.49	6.15	3.42	9	14	28
		5-gal cans ⁶	40.5	0.81	1	8.00	0.125	250.0	280.0	200.0		49.40	55.30	40.00	74	124	248
3	Jet fuel (JP-4)	Bulk				6.42	0.156	312.0	349.4		8.058						
		55-gal drums ³	399.0	9.03	11	7.39	0.135	270.0	302.4	187.8		5.01	5.61	3.48	8	13	25
		55-gal drums ⁴	415.0	8.80	11	7.68	0.130	260.0	291.2	192.7		4.82	5.40	3.57	8	12	24
		55-gal drums ⁵	392.0	9.20	11	7.40	0.135	270.0	302.4	181.2		5.10	5.71	3.42	8	14	28
4	MOGAS	Bulk				6.11	0.164	327.3	366.6		8.73						
		55-gal drums ³	384.0	9.03	11	7.11	0.141	281.2	315.1	187.8		5.21	5.83	3.48	8	13	26
		55-gal drums ⁴	400.0	8.80	11	7.41	0.135	269.9	302.3	192.8		5.00	5.60	3.57	8	13	26
		55-gal drums ⁵	376.0	9.20	11	7.09	0.141	282.1	315.9	181.2		5.32	5.96	3.42	8	14	28
		5-gal cans ⁶	41.6	0.81	1	8.32	0.120	240.4	269.2	200.0		48.10	53.80	40.00	73	121	242
5	Diesel fuel	Bulk				6.99	0.143	286.1	320.5		7.63						
		55-gal drums ³	432.0	9.03	11	8.00	0.125	250.0	280.0	187.8		4.63	5.19	3.48	7	12	24
		55-gal drums ⁴	448.0	8.80	11	8.30	0.120	241.0	269.9	192.7		4.46	5.00	3.57	7	12	24
		55-gal drums ⁵	430.0	9.20	11	8.11	0.123	246.6	276.2	181.2		4.65	5.21	3.42	7	12	24
		5-gal cans ⁶	46.0	0.81	1	9.20	0.109	317.4	243.5	200.0		43.50	48.70	40.00	66	109	218
6	Kerosene	Bulk				6.80	0.147	294.1	329.4		7.84						
		55-gal drums ³	421.0	9.03	11	7.80	0.128	256.4	287.1	187.8		4.75	5.32	3.48	8	12	24
		55-gal drums ⁴	437.0	8.80	11	8.09	0.124	247.2	276.9	192.8		4.58	5.13	3.57	7	12	24
		55-gal drums ⁵	351.0	9.20	11	6.62	0.151	302.1	338.3	181.2		5.70	6.38	3.42	9	15	30
		5-gal cans ⁶	45.0	0.81	1	9.00	0.111	222.2	248.9	200.0		44.40	49.80	40.00	67	112	224
7	Lub oils	Bulk				7.60	0.132	263.2	294.7		7.02						
		55-gal drums ³	472.0	9.03	11	8.58	0.117	233.1	261.0	191.3		4.24	4.75	3.48	7	11	22
		55-gal drums ⁴	488.0	8.80	11	8.87	0.113	225.5	252.5	196.4		4.10	4.59	3.57	7	11	22
		55-gal drums ⁵	462.0	9.20	11	8.56	0.117	233.6	261.7	184.6		4.33	4.85	3.42	7	11	22
		5-gal cans ⁶	49.0	0.81	1	9.80	0.102	204.1	228.6	181.2		40.80	45.70	40.00	62	103	206
		1-qt cans (12 per case)	35.0	0.88	1							58.00	64.90	40.00	86	143	286
		1-qt cans (24 per case)	60.0	1.60	2							33.40	37.30	20.00	50	84	168
		5-qt cans (6 per case)	77.0	1.90	2							26.00	29.10	20.00	39	65	130
8	Greases	25-lb pails	29.0	0.95	1							69.00	77.20	40.00	104	173	346
		5-lb cans (6 per case)	44.0	1.10	2							45.40	50.90	20.00	69	114	227
	Fog oils:																
9	SGF1	Bulk				7.11	0.140	281.0	314.0		7.49						
		55-gal drums ³	438.0	9.03	11	8.11	0.123	246.6	276.2	191.3		4.50	5.02	3.48	7	11	22
		55-gal drums ⁴	588.0	8.80	11	8.40	0.110	238.0	266.6	196.4		4.32	4.84	3.57	7	11	22
		55-gal drums ⁵	421.0	9.20	11	8.10	0.123	246.9	276.5	184.6		4.57	5.12	3.42	7	11	22

Table 5-11—Continued

1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Product	Packaging	Wt (lb)	Cu ft		Conversion factors		Gal per STON	Gal per LTON	Gal per MTON ¹	Bbl per LTON ¹	Packages per STON	Packages per LTON	Packages per MTON	Cap of veh for carrying filled containers ²		
				Actual	Plan- ning factor	Gal to lb	Lb to gal								1½-ton tlr	2½-ton trk	5-ton trk
10	SGF2-----	Bulk-----				6.99	0.143	286.0	320.0	-----	7.63	-----	-----	-----	-----	-----	-----
		55-gal drums ³ -----	431.0	9.03	11	7.99	0.120	250.3	280.3	191.3	-----	4.54	5.09	3.48	7	11	22
		55-gal drums ⁴ -----	616.0	8.80	11	8.28	0.120	241.5	270.5	196.4	-----	4.39	4.90	3.57	7	11	22
		55-gal drums ⁵ -----	478.0	9.20	11	7.90	0.121	253.1	283.5	184.6	-----	4.68	5.25	3.42	7	11	23

¹ For ocean-shipping, storage, and pipeline computations, bulk petroleum products usually are measured in bbl of 42 gal each or in LTON.

² Based on authorized loads in STON. When overloads are authorized, these quantities may be increased to the cubic capacity of the veh or to 100-percent overweight, whichever limit is reached first.

³ 18-gage standard—weighs 54 lb empty—filled to 54 gal with light products, 55 gal with heavy products. Federal Specification PPP-D-729, Amendment 1.

⁴ 11 gage standard—weighs 70 lb empty—filled to 54 gal with light products, 55 gal with heavy products. Federal Specification PPP-D-729, Amendment 1.

⁵ 18-gage limited standard—weighs 52 lb empty—filled to 53 gal with light products, 54 gal with heavy products. Federal Specification PPP-D-729.

⁶ For planning purposes, weight of gas may be taken as 42 lb and weight of lub oil for engines as 50 lb per 5-gal can, including weight of can. Cans, 5-gal, weigh approximately 11 lb empty.

Note. Factors in this table are based on U.S. gal.

5-6. Estimating Class III Requirements

a. Estimating Solid Fuel Requirements. The factors below are based on the use of coal only, assuming use of no petroleum products or gas. When firewood or peat is substituted, 2 pounds of such fuel is required in lieu of 1 pound of coal. Factors apply to temperate climate.

(1) Utilities.

Item	Weight
Space, water heating, and cooking, per man per day.....	4 lb
Cooking only, per man per day.....	1.5 lb
Hospital use, per bed per day:	
Winter.....	12 lb
Summer.....	5 lb
Laundry, fixed, per unit per day.....	32 STON

(2) *Steam locomotives.* Table 5-12 includes coal and fuel oil consumption data for steam locomotives. Rate of consumption is designated in pounds either per train kilometer (tn-km) or per hour.

(a) In estimating coal requirements, add 10 percent to computed rate of consumption to allow for spillage and waste.

(b) For general planning, assume operation of switch engines for 20 hours a day; allow 4 hours a day for maintenance.

b. Estimating Liquid Fuel Requirements. Major factors that control liquid fuel requirements in military operations are as follows:

(1) *Displacement.* The average distance that each vehicle moves is determined by measuring the distance that the center of mass moves. Administrative or march movements are computed on the basis of using available road nets. Movements under battle conditions are computed on the basis of selected elements of the organization proceeding cross country. Experience tables provide consumption data for moving an organization. For planning, assume that cross-country-battle fuel consumption is at a rate of 2.5 times that given for road movements in the fuel data tables in paragraph 5-7.

(2) *Supply.* During a displacement, certain vehicles of an organization must make round-trip

supply hauls. Since these hauls generally are made to supply points at varying distances from the organization, an average round-trip supply distance must be determined. Experience indicates that daily requirements for supply hauls are about equal to 10 percent of the total organizational consumption per kilometer or displacement multiplied by the average round-trip supply distance. When the organization is not on the move, supply haul requirements are included in the composite requirement described in (4) below and are not computed separately.

(3) *Service.* Supplemental daily requirements exist for movement of vehicles in bivouac areas and on reconnaissance, engine warmup, and abnormal periods of low-gear operation. These items will differ with the nature of the operation, weather, roads, and terrain and they must be estimated in accordance with general conditions. Under average conditions, these requirements can be estimated by using the consumption necessary to move all vehicles in the organization 16 kilometers over roads. This factor applies when the organization is on the march or in combat.

(4) *Housekeeping.* Additional daily requirements exist for administrative vehicles, kitchens, and gasoline-powered equipment and for maintaining and testing engines. When the organization is not on the march, these requirements are grouped in a composite daily requirement as noted under each fuel data table in paragraph 5-7. When the organization is on the move, the requirements for administrative vehicles (not supply hauls) and gasoline-powered equipment are absorbed by maintenance, and the testing factor is absorbed by the service factor. However, the kitchen requirement must be added on the basis of a daily consumption per kitchen of 15 gallons of gasoline.

(5) *Wastage.* This factor covers evaporation, spillage, and small combat losses. It applies only to road movement in the combat zone. Its computation is 10 percent of the sum of all other consumption figures.

Table 5-12. Steam Locomotive Fuel Requirements

		1	2	3	4
1		Type of locomotive	Type of operation	Average rate of consumption	
				Lb per tn-km	Lb per hr
Coal					
2	2-8-0, 82-ton, std-gage.....		Road	56	700
3	2-8-0, 90-ton, std-gage.....		Road	71	950
4	2-8-2, 60-ton, narrow-gage.....		Road	62	750
Fuel oil					
5	2-8-0, std-gage.....		Road	35	450
6	2-8-2, narrow-gage.....		Road	38	500

(6) *Example.* An infantry division (mechanized) (table 5-17) including seven infantry battalions (mechanized) and three tank battalions (table 5-18) is to make the following movement: 1st day — 150 kilometers in zone to bivouac area at field army rear boundary; 2d day — no movement; 3d day — 100 kilometers forward in combat zone; and 4th day — 10 kilometers, with 8 kilometers under cross-country battle conditions for all elements except the division support command (DISCOM). Average round-trip supply distances are for the 1st day, 50 kilometers; the 2d day, 30 kilometers; the 3d day, 60 kilometers; and the 4th day, 50 kilometers. Estimate the total number of gallons of diesel and gasoline required for the 4-day period.

Note. Paragraph 5-7 contains supplemental information.

1st day

- (a) Displacement of 150 km:
1. Diesel requirements:
Multiply 150 km by 143.13 gal per km (from table 5-17, colm 3) and by 169.29 gal per km (for 7 inf (mech) and 3 tk bn) (table 5-18, colm 3)..... = 46,863
 2. Gasoline requirements:
Multiply 150 km by 156.18 and 255.79 gal per km (from same tables, colm 4)..... = 60,735
- (b) Supply requirements:
1. Diesel—multiply 50 km (supply distance) by 31.24 (10 percent of division consumption per km)..... = 1,562
 2. Gasoline—multiply 50 km (supply distance) by 41.20 (10 percent of division consumption per km)..... = 2,060
- (c) Service requirements:
1. Diesel—multiply 16 km by 312.4 (total division consumption per km).... = 4,998
 2. Gasoline—multiply 16 km by 412.0 (total division consumption per km).... = 6,592
- (d) Kitchen requirements:
Gasoline—multiply 15 gal by 123 organic kitchens..... = 1,845

2d day

- (e) Requirements when division is not on the march (from para 5-7b(4)):
Gasoline..... = 4,000

3d day

- (f) Displacement of 100 km:
1. Diesel requirements:
Multiply 100 km by 312.4 gal per km. = 31,240
 2. Gasoline requirements:
Multiply 100 km by 412.0 gal per km. = 41,200
- (g) Supply requirements:
1. Diesel—multiply 60 km by 31.24 (10 percent of division consumption per km)..... = 1,874
 2. Gasoline—multiply 60 km by 41.20 (10 percent of division consumption per km)..... = 2,472

- (h) Service requirements:
1. Diesel—multiply 16 km by 312.4 gal per km..... = 4,998
 2. Gasoline—multiply 16 km by 412.0 gal per km..... = 6,592
- (i) Kitchen requirements:
Gasoline—multiply 15 gal by 123 organic kitchens..... = 1,845
- (j) To account for wastage:
1. Diesel—take 10 percent of (f)1 + (g)1 + (h)1 above..... = 3,811
 2. Gasoline—take 10 percent of (f)2 + (g)2 + (h)2 + (i) above..... = 5,211

4th day

- (k) Displacement of entire division 10 km (with 8 km cross-country and 2 km on roads):
1. Diesel requirements:
Multiply 2 km (road displacement) by 312.4 gal per km..... = 625
 2. Gasoline requirements:
Multiply 2 km (road displacement) by 412.0 gal per km..... = 824
- (l) Displacement of DISCOM:
1. Diesel requirements:
Multiply 8 km (road displacement) by 19.07 gal per km..... = 153
 2. Gasoline requirements:
Multiply 8 km (road displacement) by 24.67 gal per km..... = 197
- (m) Displacement of combat units:
1. Diesel requirements:
Multiply 8 km (cross-country battle displacement) by 293.35 gal per km (division total less DISCOM total) multiplied by 2.5 for cross-country battle factor (para 5-6b(1))..... = 5,867
 2. Gasoline requirements:
Multiply 8 km (cross-country battle displacement) by 387.30 gal per km (division total less DISCOM total) multiplied by 2.5 for cross-country battle factor..... = 7,746
- (n) Supply requirements:
1. Diesel—multiply 50 km (supply distance) by 31.24 (10 percent of division consumption per km)..... = 1,562
 2. Gasoline—multiply 50 km (supply distance) by 41.20 (10 percent of division consumption per km)..... = 2,060
- (o) Service requirements:
1. Diesel—multiply 16 km by 312.4 gal per km..... = 4,998
 2. Gasoline—multiply 16 km by 412.0 gal per km..... = 6,592
- (p) Kitchen requirements:
Gasoline—multiply 15 gal by 123 organic kitchens..... = 1,845
- (q) To account for wastage:
1. Diesel—take 10 percent of (k)1 + (l)1 + (m)1 + (n)1 above..... = 734
 2. Gasoline—take 10 percent of (k)2 + (l)2 + (m)2 + (n)2 + (o)2 + (p) above..... = 1,152

(r) Total estimate for 4 days:

1. Diesel—add (a)1 + (b)1 + (c)1 + (f)1 + (g)1 + (h)1 + (j)1 + (k)1 + (l)1 + (m)1 + (n)1 + (o)1 + (q)1... = 109,285
2. Gasoline—add (a)2 + (b)2 + (c)2 + (d)2 + (e)2 + (f)2 + (g)2 + (h)2 + (i)2 + (j)2 + (k)2 + (l)2 + (m)2 + (n)2 + (o)2 + (p)2 + (q)2----- = 154,029

c. *Gallons-Per-Man-Per-Day Method of Estimating Petroleum Requirements.* The gallons-per-man-per-day method of estimating petroleum requirements is used in the early planning stages when definitive information is not available on the numbers and types of vehicles. Because of the variables in organizational composition, this method is seldom used below field army and never below corps; however, once established for a given theater, the figures may be used for requisitioning purposes by smaller units. *The gallons-per-man-per-day method is to be used only as a guide, not as a substitute for more exacting computation.* The consumption in gallons-per-man-per-day in various theaters will necessarily vary with terrain, climate, ratio between land and amphibious operations, and units using special vehicles and equipment. The figures in table 5-42 should be adjusted to fit each particular area as soon as experience shows any variance between these planning factors and actual usage. To compute estimated petroleum requirements, multiply troop strength by factors listed in table 5-42.

5-7. Fuel Requirements (Field Army Units)

a. Requirements for motor gasoline (MOGAS), and diesel fuel for field army units are tabulated in tables 5-13 through 5-19.

b. Tabulations are governed by the following:

(1) Columns 3 and 4 of each table show the number of gallons of fuel required to move a specific unit 1 kilometer (except for Army aircraft, which are not transported on the ground). Although class III(A) fuel is not considered in moving a unit on the ground, the class III(W) fuel used by the tankers carrying class III(A) fuel during the move is counted. When multifuel equipment is used, diesel consumption is assumed for those particular items of equipment.

(2) Figures in columns 3 and 4 do not include fuel requirements of equipment that normally does not move under its own power on long marches, e.g., equipment mounted on vehicles, bulldozers, scoop-type loaders, or forklift trucks.

(3) The number of gallons in columns 3 and 4 are multiplied by a factor of 2.5 for cross-

country battle conditions. The 10-percent handling factor (para 5-6b(5)) is not applied when the cross-country factor is used.

(4) When a unit is not on the march, 4,000 gallons of fuel per division is required for administrative vehicles, kitchens, and gasoline-powered equipment. Daily consumption of gasoline per kitchen is 15 gallons (FM 10-13).

(5) Fuel reserve in vehicles has been computed as two 5-gallon cans per truck, except for 1/4-ton trucks and similar small vehicles, which carry one 5-gallon can each, and 2 1/2- and 5-ton wreckers, which carry four 5-gallon cans each.

(6) Columns 9 through 12 represent carrying capacity of all metal tanks, tankers, collapsible drums, and fuel-dispensing vehicles organic to each division. Units authorized airplanes and helicopters use a portion of their bulk fuel-carrying capacity for class III(A) fuel.

(7) To obtain other POL requirements, multiply the basic fuel amount by the following factors:

Product	Per Cent of Fuel	Unit of Measure
Engine Oil-----	2%	Gallons
Gear Lube-----	1%	Gallons
Grease-----	2%	Pounds

(8) Division tables are based on the engineer bridge company with mobile assault bridging.

(9) Column 13 was determined at 150 men per kitchen.

c. *Pipeline Requirements.* Estimates of daily requirements for a 12-division field army are based on a factor of 7-gallons per man per day. Requirements for this force vary from 3,000,000 to 4,000,000 gallons daily; for an eight-division field army, they vary from 2,000,000 to 3,000,000 gallons per day, depending in each instance on the composition of the force and the tactical situation. However, for forces smaller than a 12-division field army, the 7-gallon per man per day factor tends to vary. When COMMZ and tactical air force requirements are added to the field army requirements, the estimated total theater average may be increased to 6,000,000 gallons per day to support a 12-division field army and to 4,000,000 gallons per day to support an eight-division field army. The petroleum system must provide for the reception, storage, maintenance, and distribution and issue of the types and quantities of fuels that these requirements represent. To satisfy this demand, six 8-inch pipelines, or two per corps, are required to support a 12-division force.

Table 5-13. Airborne Division (TOE 57G)—Fuel Data

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Unit	TOE	Fuel to move 1 km (gal)		Fuel cap (gal)								kitchens
			Diesel	Gas	Veh tks		Gas cans		Bulk fuel		Total fuel cap		
					Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	
2	HHC.....	57-4G	0.06	1.95	50	658	10	230	-----	-----	60	888	1
3	Avn bn.....	1-55G	0.83	2.44	750	869	150	340	13,161	9,139	14,061	10,348	2
4	HHC.....	1-56G	(0.17)	(1.27)	(150)	(458)	(30)	(175)	(124)	(376)	(304)	(1,009)	---
5	Airmbl co (lt).....	1-57G	(0.44)	(0.53)	(400)	(185)	(80)	(75)	(8,947)	(4,133)	(9,427)	(4,393)	(1)
6	Avn GS co.....	1-58G	(0.22)	(0.64)	(200)	(226)	(40)	(90)	(4,090)	(4,630)	(4,330)	(4,946)	(1)
7	Engr bn.....	5-25G	4.00	9.34	650	2,602	70	870	1,443	3,417	2,163	6,889	4
8	HHC.....	5-26G	(3.82)	(3.55)	(500)	(1,186)	(40)	(165)	(1,443)	(3,417)	(1,983)	(4,768)	(1)
9	3 engr co (each).....	5-27G	(0.06)	(1.93)	(50)	(472)	(10)	(235)	-----	-----	(60)	(707)	(1)
10	Div arty.....	6-200G	1.88	21.34	1,650	6,683	330	2,515	-----	3,500	1,980	12,698	13
11	HHB.....	6-201G	(0.17)	(2.56)	(150)	(929)	(30)	(340)	-----	(500)	(180)	(1,769)	(1)
12	3 FA bn, 105-mm, towed (each).....	6-215G	(0.57)	(6.26)	(500)	(1,918)	(100)	(725)	-----	(1,000)	(600)	(3,643)	(4)
13	HQ, H&S btry.....	6-216G	(0.39)	(2.90)	(350)	(772)	(70)	(275)	-----	(1,000)	(420)	(2,047)	(1)
14	3 FA btry (each).....	6-217G	(0.06)	(1.12)	(50)	(382)	(10)	(150)	-----	-----	(60)	(532)	(1)
15	9 abn inf bn (each).....	7-35G	0.44	7.36	600	1,379	120	550	702	1,298	1,422	3,227	4
16	HHC.....	7-36G	(0.44)	(3.49)	(600)	(1,109)	(120)	(415)	(702)	(1,298)	(1,422)	(2,822)	(1)
17	3 rifle co (each).....	7-37G	-----	(1.29)	-----	(90)	-----	(45)	-----	-----	-----	(135)	(1)
18	DISCOM.....	29-51G	3.03	12.96	3,220	4,694	540	1,705	1,248	2,532	5,008	8,931	10
19	HHC and band.....	29-52G	(0.06)	(0.45)	(50)	(167)	(10)	(55)	-----	-----	(60)	(222)	(1)
20	Med bn.....	8-65G	(0.24)	(6.29)	(200)	(2,374)	(40)	(840)	-----	(1,000)	(240)	(4,214)	(2)
21	HQ and spt co.....	8-66G	(0.06)	(2.00)	(50)	(745)	(10)	(270)	-----	(1,000)	(60)	(2,015)	(2)
22	3 med co (each).....	8-67G	(0.06)	(1.43)	(50)	(543)	(10)	(190)	-----	-----	(60)	(733)	---
23	Sup co.....	10-37G	(0.22)	(0.64)	(200)	(245)	(40)	(85)	(1,248)	(1,532)	(1,488)	(1,862)	(1)
24	QM air equip co.....	10-337G	(0.73)	(0.29)	(680)	(109)	(130)	(35)	-----	-----	(810)	(144)	(1)
25	Admin co.....	12-157G	(0.79)	(0.95)	(1,190)	(345)	(140)	(125)	-----	-----	(1,330)	(470)	(2)
26	Maint bn.....	29-55G	(0.99)	(4.34)	(900)	(1,454)	(180)	(565)	-----	-----	(1,080)	(2,019)	(3)
27	HHD.....	29-56G	-----	(0.27)	-----	(99)	-----	(35)	-----	-----	-----	(134)	(1)
28	Gnd maint co.....	29-57G	(0.33)	(3.08)	(300)	(1,078)	(60)	(405)	-----	-----	(360)	(1,483)	(1)
29	Trans acft maint co.....	55-99G	(0.66)	(0.99)	(600)	(277)	(120)	(125)	-----	-----	(720)	(402)	(1)
30	Sig bn.....	11-215G	0.22	6.99	200	2,517	40	920	682	998	922	4,435	3
31	HHC.....	11-216G	(0.22)	(0.79)	(200)	(293)	(40)	(105)	(682)	(998)	(922)	(1,396)	(1)
32	Sig CO co.....	11-217G	-----	(3.00)	-----	(1,056)	-----	(395)	-----	-----	-----	(1,451)	(1)
33	Sig spt op co.....	11-218G	-----	(3.20)	-----	(1,168)	-----	(420)	-----	-----	-----	(1,588)	(1)
34	Armd cav sqdn.....	17-75G	9.94	7.73	850	2,615	170	865	3,024	1,496	4,044	4,956	6
35	HHT.....	17-76G	(0.50)	(3.54)	(450)	(1,044)	(90)	(350)	-----	-----	(540)	(1,934)	(1)
36	2 armed cav trip (each).....	17-77G	-----	(1.82)	-----	(688)	-----	(220)	-----	-----	-----	(908)	(2)
37	Air cav trp.....	17-78G	(0.44)	(0.55)	(400)	(195)	(80)	(75)	(3,024)	(1,476)	(3,504)	(1,746)	(1)
38	3 bde HHC (each).....	57-42G	0.06	1.41	200	326	40	150	-----	-----	240	476	1
39	MP co.....	19-67G	-----	1.46	-----	558	-----	170	-----	-----	-----	728	0
40	Total.....		15.10	134.68	13,370	34,585	2,510	13,015	25,876	32,744	41,756	80,344	78

Table 5-14. Airmobile Division (TOE 67T)—Fuel Data*

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Unit	TOE	Fuel to move 1 km (gal)		Fuel cap (gal)								kitchens
			Diesel	Gas	Veh tks		Gas cans		Bulk fuel		Total fuel cap		
					Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	
2	HHC	67-2T	0.17	1.71	150	628	30	320			180	948	1
3	MP co	19-27T		1.57		562		185				747	1
4	Avn gp	1-100T	2.92	13.70	2,600	4,744	520	1,815	7,396	9,404	10,516	15,963	18
5	HHC	1-101T	(0.11)	(2.18)	(100)	(793)	(20)	(295)			(120)	(1,088)	(2)
6	GS avn co	1-102T	(0.66)	(0.99)	(600)	(359)	(120)	(135)	(3,000)	(1,800)	(3,720)	(2,294)	(2)
7	2 aslt hel by (each)	1-155T	(0.90)	(4.47)	(800)	(1,488)	(160)	(595)	(1,664)	(3,136)	(2,624)	(5,219)	(5)
8	HHC	1-156T	(0.22)	(0.94)	(200)	(348)	(40)	(125)			(240)	(473)	(1)
9	Aerial wpns co	1-157T	(0.17)	(1.04)	(150)	(339)	(30)	(140)	(368)	(832)	(548)	(1,311)	(1)
10	3 aslt hel co (each)	1-158T	(0.17)	(0.83)	(150)	(267)	(30)	(110)	(432)	(768)	(612)	(1,145)	(1)
11	Aslt spt hel bn	1-165T	(0.35)	(1.59)	(300)	(616)	(60)	(195)	(1,068)	(1,332)	(1,428)	(2,143)	(4)
12	HHC	1-166T	(0.17)	(0.48)	(150)	(187)	(30)	(30)	(1,068)	(1,332)	(1,248)	(1,579)	(1)
13	3 aslt spt hel co (each)	1-167T	(0.06)	(0.37)	(50)	(143)	(10)	(45)			(60)	(188)	(1)
14	Sig bn	11-205T		3.79		1,443		445				1,888	3
15	HQ, H&S co	11-206T		(0.75)		(270)		(100)				(370)	(1)
16	Co co	11-207T		(3.04)		(1,173)		(345)				(1,518)	(2)
17	Engr bn	5-215T	0.06	7.31	50	2,825	10	910			60	3,735	5
18	HHC	5-216T	(0.06)	(4.70)	(50)	(1,901)	(10)	(550)			(60)	(2,451)	(2)
19	3 cbt engr co (each)	5-217T		(0.87)		(308)		(120)				(428)	(1)
20	3 bde HHC (each)	67-42T	(0.06)	1.59	50	529	10	195	104	1,096	164	1,820	2
21	Cav sqdn	17-95T	0.83	5.49	750	1,935	150	695	2,484	2,316	3,384	4,946	5
22	HHT	17-96T	(0.83)	(1.96)	(750)	(699)	(150)	(245)	(2,484)	(2,316)	(3,384)	(3,260)	(1)
23	3 air cav trp (each)	17-98T		(0.55)		(180)		(70)				(250)	(1)
24	Cav trp	17-99T		(1.88)		(696)		(240)				(936)	(1)
25	Div arty	6-700T	1.12	10.14	1,000	3,438	200	1,285	2,000	2,000	3,200	6,723	18
26	HHB	6-701T	(0.06)	(1.32)	(50)	(430)	(10)	(160)			(60)	(590)	(1)
27	Avn btry	6-702T	(0.11)	(0.76)	(100)	(252)	(20)	(100)	(500)	(500)	(620)	(852)	(1)
28	3 FA bn, 105-mm, towed (each)	6-705T	(0.11)	(1.94)	(100)	(652)	(20)	(240)			(120)	(892)	(4)
29	HQ, H&S btry	6-706T	(0.11)	(1.52)	(100)	(526)	(20)	(195)			(120)	(721)	(1)
30	3 FA btry (each)	6-707T		(0.14)		(42)		(15)				(57)	(1)
31	FA bn, aerial arty	6-725T	(0.62)	(2.24)	(550)	(800)	(110)	(305)	(1,500)	(1,500)	(2,160)	(2,605)	(4)
32	HQ, H&S btry	6-726T	(0.11)	(0.59)	(100)	(215)	(20)	(80)			(120)	(295)	(1)
33	3 aerial arty btry (each)	6-727T	(0.17)	(0.55)	(150)	(195)	(30)	(75)	(500)	(500)	(680)	(770)	(1)
34	DISCOM	29-41T	3.23	16.53	2,910	5,339	580	2,065	6,037	676,323	9,527	683,727	23
35	HHC and band	29-42T	(0.06)	(0.82)	(50)	(307)	(10)	(105)			(60)	(412)	(1)
36	Admin co	12-77T	(0.17)	(0.59)	(150)	(225)	(30)	(75)			(180)	(300)	(3)
37	Sup bn	29-95T	(2.32)	(2.13)	(2,110)	(766)	(420)	(290)	(5,225)	(671,135)	(7,755)	(672,191)	(4)
38	HQ, H&S co	29-96T	(1.21)	(0.65)	(1,100)	(239)	(220)	(85)	(5,225)	(1,135)	(6,545)	(1,459)	(1)
39	Sup co	29-97T		(1.21)		(428)		(170)		(670,000)		(670,598)	(2)
40	QM aerial equip spt co	10-67T	(1.11)	(0.27)	(1,010)	(99)	(200)	(35)			(1,210)	(134)	(1)
41	Trans acft maint and sup bn	55-405T	(0.24)	(6.99)	(200)	(2,274)	(40)	(890)	(432)	(4,368)	(672)	(7,532)	(9)
42	HHC	55-406T		(0.67)		(246)		(90)				(336)	(1)
43	4 trans acft maint and sup co (each)	55-407T	(0.06)	(1.58)	(50)	(507)	(10)	(200)	(108)	(1,092)	(168)	(1,799)	(2)
44	Med bn	8-25T	(0.22)	(3.20)	(200)	(872)	(40)	(350)	(380)	(820)	(620)	(2,042)	(4)
45	HQ and spt co	8-26T	(0.22)	(1.04)	(200)	(431)	(40)	(125)	(380)	(820)	(620)	(1,376)	(1)
46	3 med co (each)	8-27T		(0.72)		(147)		(75)				(222)	(1)

Table 5-14—Continued

1	Unit	TOE	Fuel to move 1 km (gal)		Veh tks		Gas cans		Bulk fuel		Total fuel cap		Kitchens
			Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	
47	Maint bn	29-85T	(0.22)	(2.80)	(200)	(895)	(40)	(355)			(240)	(1,250)	(2)
48	HQ and main spt co	29-86T	(0.22)	(1.12)	(200)	(409)	(40)	(145)			(240)	(554)	(2)
49	3 fwd spt det (each)	29-87T		(0.56)		(162)		(70)				(232)	
50	9 inf bn (each)	7-55T		1.63		421		180				601	(5)
51	HHC	7-56T		(0.70)		(180)		(80)				(260)	(1)
52	3 rifle co (each)	7-57T		(0.10)		(16)		(10)				(26)	(1)
53	Cbt spt co	7-58T		(0.63)		(193)		(70)				(263)	(1)
54	Total		8.51	78.05	7,610	25,869	1,520	9,745	18,229	693,331	27,359	728,945	120

*Includes aviation fuel since movement by air is vital to the airmobile division.

Table 5-15. Armored Division Base (TOE 17G)—Fuel Data

1	Unit	TOE	Fuel to move 1 km (gal)		Veh tks		Gas cans		Bulk fuel		Total fuel cap		kitchens
			Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	
2	HHC	17-4G	0.70	3.14	540	1,391	60	295	475	1,225	1,075	2,911	1
3	MP co	19-27G	0.17	2.39	150	909	30	285			180	1,194	2
4	Sig bn	11-35G	4.80	6.74	4,350	2,446	870	920	1,438	962	6,658	4,328	5
5	HHD	11-36G	(0.44)	(0.63)	(400)	(269)	(80)	(85)	(1,438)	(962)	(1,918)	(1,316)	
6	CO co	11-37G	(1.60)	(1.81)	(1,450)	(649)	(290)	(245)			(1,740)	(894)	(2)
7	Fwd comm co	11-38G	(1.27)	(2.56)	(1,150)	(903)	(230)	(355)			(1,380)	(1,258)	(1)
8	Sig spt op co	11-39G	(1.49)	(1.74)	(1,350)	(625)	(270)	(235)			(1,620)	(860)	(2)
9	Engr bn	5-145G	10.72	23.63	5,666	10,223	480	1,140	5,432	13,648	11,578	25,011	7
10	HHC	5-146G	(4.71)	(7.36)	(1,310)	(3,291)	(200)	(450)	(5,432)	(13,648)	(6,942)	(17,389)	(2)
11	4 cbt engr co (each)	5-147G	(1.28)	(3.59)	(900)	(1,515)	(30)	(135)			(930)	(1,650)	(1)
12	Brg co	5-148G	(0.89)	(1.91)	(756)	(872)	(160)	(150)			(916)	(1,022)	(1)
13	3 bde HHC (each)	17-42G	1.86	3.13	1,320	1,176	60	190	899	801	2,279	2,167	2
14	Armd cav sqdn	17-105G	7.00	53.01	5,230	13,657	670	380	6,069	2,331	17,259	17,878	6
15	HHT	17-106G	(4.86)	(3.32)	(3,514)	(1,349)	(510)	(250)	(6,069)	(2,331)	(10,093)	(3,930)	(2)
16	3 armd cav trp (each)	17-107G	(0.47)	(16.42)	(370)	(4,045)	(10)	(25)			(380)	(4,070)	(1)
17	Air cav trp	17-108G	(0.73)	(0.43)	(606)	(173)	(130)	(55)	*(5,290)	*(1,510)	(6,026)	(1,738)	(1)
18	Div arty	6-300G	88.18	27.61	37,724	10,371	2,770	3,150	12,380	4,800	52,874	18,321	24
19	HHB	6-302G	(0.84)	(3.31)	(728)	(1,177)	(140)	(405)	(380)	(1,200)	(1,248)	(2,782)	(1)
20	3 FA bn, 155-mm, SP (each)	6-365G	(22.15)	(4.02)	(9,258)	(1,512)	(600)	(540)	(3,000)	(600)	(12,858)	(2,652)	(5)
21	HHB	6-366G	(1.52)	(2.05)	(1,040)	(764)	(40)	(270)			(1,080)	(1,034)	(1)
22	3 FA btry (each)	6-367G	(5.76)	(0.52)	(1,944)	(188)	(90)	(70)			(2,034)	(258)	(1)
23	Svc btry	6-369G	(3.35)	(0.41)	(2,386)	(184)	(290)	(60)	(3,000)	(600)	(5,676)	(844)	(1)
24	FA bn, 155-mm/8-in. SP	6-355G	(19.95)	(5.32)	(8,394)	(1,974)	(670)	(555)	(2,400)	(1,200)	(11,464)	(3,729)	(5)
25	HQ, H & S btry	6-356G	(2.73)	(3.54)	(1,974)	(1,309)	(250)	(310)	(2,400)	(1,200)	(4,624)	(2,819)	(1)
26	3 FA btry, 155-mm, SP (each)	6-357G	(4.44)	(0.39)	(1,314)	(137)	(90)	(55)			(1,404)	(192)	(1)
27	FA btry, 8-in. SP	6-358G	(3.90)	(0.61)	(2,478)	(254)	(150)	(80)			(2,628)	(334)	(1)
28	FA bn, HJ	6-175G	(0.94)	(6.92)	(828)	(2,684)	(160)	(570)	(600)	(600)	(1,588)	(3,854)	(3)
29	HHB	6-176G	(0.50)	(1.96)	(428)	(750)	(80)	(260)	(600)	(600)	(1,108)	(1,610)	(1)

See footnote at end of table.

Table 5-15--Continued

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Unit	TOE	Fuel to move 1 km (gal)		Fuel cap (gal)								kitchens
			Diesel	Gas	Veh tks		Gas cans		Bulk fuel		Total fuel cap		
					Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	
30	2 FA btry (each).....	6-177G	(0.22)	(2.48)	(200)	(967)	(40)	(155)	-----	-----	(240)	(1,122)	(1)
31	ADA bn, Chap/Vulc, SP.....	44-325T	6.91	5.61	4,760	2,119	740	735	9,570	3,930	15,070	6,784	5
32	HHB.....	44-326T	(0.79)	(1.13)	(556)	(473)	(120)	(145)	(810)	(690)	(1,486)	(1,308)	(1)
33	2 ADA btry, Vulc, SP (each).....	44-327T	(1.44)	(0.87)	(982)	(319)	(150)	(115)	(2,280)	(720)	(3,412)	(1,154)	(1)
34	2 ADA btry, Chap, SP (each).....	44-328T	(1.62)	(1.37)	(1,120)	(504)	(160)	(180)	(2,100)	(900)	(3,380)	(1,584)	(1)
35	DISCOM.....	29-21G	20.07	26.54	18,560	11,652	3,590	2,740	160,200	35,348	182,350	49,740	19
36	HHC and band.....	29-2G	(0.28)	(0.56)	(250)	(208)	(50)	(70)	-----	-----	(300)	(278)	(1)
37	Admin co.....	12-37G	(0.33)	(1.04)	(300)	(424)	(60)	(130)	-----	-----	(360)	(554)	(3)
38	Med bn.....	8-35G	(2.37)	(3.73)	(2,150)	(1,862)	(430)	(730)	-----	-----	(2,580)	(2,592)	(4)
39	HQ and spt co.....	8-36G	(1.05)	(1.60)	(950)	(578)	(190)	(220)	-----	-----	(1,140)	(798)	(1)
40	3 med co (each).....	8-37G	(0.44)	(0.71)	(400)	(428)	(80)	(170)	-----	-----	(480)	(598)	(1)
41	Maint bn.....	29-35G	(8.19)	(17.59)	(7,600)	(7,719)	(1,460)	(1,305)	(2,628)	(2,620)	(11,688)	(11,644)	(7)
42	HQ and main spt co.....	29-36G	(2.87)	(7.25)	(2,670)	(3,260)	(510)	(555)	(540)	(660)	(3,720)	(4,475)	(3)
43	3 fwd spt co (each).....	29-37G	(1.34)	(3.07)	(1,240)	(1,308)	(240)	(205)	(584)	(616)	(2,064)	(2,129)	(1)
44	Trans acft maint co.....	55-424G	(1.30)	(1.13)	(1,210)	(535)	(230)	(135)	(336)	(112)	(1,776)	(782)	(1)
45	S&T bn.....	29-65G	(8.90)	(3.62)	(8,260)	(1,439)	(1,590)	(505)	(157,572)	(32,728)	(167,422)	(34,672)	(4)
46	HHC.....	29-6G	(0.17)	(0.77)	(150)	(280)	(30)	(100)	-----	-----	(180)	(380)	(1)
47	S&S co.....	10-7G	(1.16)	(1.58)	(1,060)	(592)	(210)	(230)	(47,500)	(30,000)	(48,770)	(30,822)	(1)
48	TMT co.....	55-87G	(7.25)	(0.57)	(6,750)	(282)	(1,290)	(80)	(107,200)	-----	(115,240)	(362)	(2)
49	Div avn spt det.....	1-87G	(0.32)	(0.70)	(300)	(285)	(60)	(95)	(2,872)	(2,728)	(3,232)	(3,108)	-----
50	Total.....		144.13	158.06	80,940	56,296	9,390	10,215	198,261	64,647	293,881	132,668	75

*Not included in totals. Unit bulk capacity of 6,800 gallons used to carry JP-4 fuel for organic helicopters.

Table 5-16. Infantry Division Base (TOE 7G)—Fuel Data

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Unit	TOE	Fuel to move 1 km (gal)		Fuel cap (gal)								kitchens
					Veh tks		Gas cans		Bulk fuel		Total fuel cap		
			Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	
2	HHC.....	7-4G	0.39	2.21	350	976	70	270	-----	-----	420	1,246	1
3	MP co.....	19-27G	0.17	2.39	150	909	30	285	-----	-----	180	1,194	2
4	Avn bn.....	1-75G	1.21	2.66	1,100	1,074	220	360	11,068	5,932	12,388	7,366	4
5	HHD.....	1-76G	(0.11)	(1.34)	(100)	(570)	(20)	(180)	-----	-----	(120)	(750)	(1)
6	Airbml co (lt).....	1-77G	(0.55)	(0.75)	(500)	(283)	(100)	(105)	(6,508)	(3,692)	(7,108)	(4,080)	(2)
7	Avn GS co.....	1-78G	(0.55)	(0.57)	(500)	(221)	(100)	(75)	(4,560)	(2,240)	(5,160)	(2,536)	(1)
8	Sig bn.....	11-35G	4.80	6.74	4,350	2,446	870	920	1,438	962	6,658	4,328	4
9	HHD.....	11-36G	(0.44)	(0.63)	(400)	(269)	(80)	(85)	(1,438)	(962)	(1,918)	(1,316)	-----
10	CO co.....	11-37G	(1.60)	(1.81)	(1,450)	(649)	(290)	(245)	-----	-----	(1,740)	(894)	(1)
11	Fwd comm co.....	11-38G	(1.27)	(2.56)	(1,150)	(903)	(230)	(355)	-----	-----	(1,380)	(1,258)	(1)
12	Sig spt co.....	11-39G	(1.49)	(1.74)	(1,350)	(625)	(270)	(235)	-----	-----	(1,620)	(860)	(2)
13	Engr bn.....	5-155G	16.57	10.49	10,696	4,622	1,670	830	5,344	5,000	17,710	10,452	7
14	HHC.....	5-156G	(6.40)	(4.46)	(2,120)	(1,890)	(350)	(340)	(5,344)	(5,000)	(7,814)	(7,230)	(2)
15	4 engr co (each).....	5-157G	(2.32)	(1.03)	(1,955)	(465)	(290)	(85)	-----	-----	(2,245)	(550)	(1)
16	Brg co.....	5-148G	(0.89)	(1.91)	(756)	(872)	(160)	(150)	-----	-----	(916)	(1,022)	(1)
17	3 bde HHC (each).....	7-42G	0.28	1.94	250	796	50	260	-----	500	300	1,556	2
18	Armd cav sgdn.....	17-105G	7.00	53.01	5,230	13,657	670	380	11,359	3,841	17,259	17,878	6

Table 5-16—Continued

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Unit	TOE	Fuel to move 1 km (gal)		Fuel cap (gal)								kitchens
			Veh tks		Gas cans		Bulk fuel		Total fuel cap				
			Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	
19	HHT.....	17-106G	(4.86)	(3.32)	(3,514)	(1,349)	(510)	(250)	(6,069)	(2,331)	(10,093)	(3,930)	(2)
20	3 armd cav trp (each).....	17-107G	(0.47)	(16.42)	(370)	(4,045)	(10)	(25)	-----	-----	(380)	(4,070)	(1)
21	Air cav trp.....	17-108G	(0.73)	(0.43)	(606)	(173)	(130)	(55)	(5,290)	(1,510)	(6,026)	(1,738)	(1)
22	Div arty.....	6-100G	18.65	29.37	16,190	11,326	2,630	3,250	5,180	4,800	24,000	19,376	21
23	HHB.....	6-302G	(0.84)	(3.31)	(728)	(1,177)	(140)	(405)	(380)	(1,200)	(1,248)	(12,782)	(1)
24	3 FA bn, 105-mm, towed (each).....	6-155G	(2.36)	(4.93)	(2,622)	(1,947)	(540)	(555)	(600)	(600)	(3,762)	(3,102)	(4)
25	FA bn, 155-mm/8-in., towed.....	6-165G	(9.79)	(4.35)	(6,768)	(1,624)	(710)	(610)	(2,400)	(1,200)	(9,878)	(3,434)	(5)
26	HQ, H&S btry.....	6-166G	(2.26)	(2.24)	(1,734)	(836)	(200)	(320)	(2,400)	(1,200)	(4,334)	(2,356)	(1)
27	3 FA btry, 155-mm, towed (each).....	6-167G	(1.21)	(0.50)	(852)	(178)	(120)	(70)	-----	-----	(972)	(248)	(1)
28	FA btry, 8-in. towed.....	6-358G	(3.90)	(0.61)	(2,478)	(254)	(150)	(80)	-----	-----	(2,628)	(334)	(1)
29	FA bn, HJ.....	6-175G	(0.94)	(6.92)	(828)	(2,684)	(160)	(570)	(600)	(600)	(1,588)	(3,854)	(3)
30	HHB.....	6-176G	(0.50)	(1.96)	(428)	(750)	(80)	(260)	(600)	(600)	(1,108)	(1,610)	(1)
31	2 FA btry, (each).....	6-177G	(0.22)	(2.48)	(200)	(967)	(40)	(155)	-----	-----	(240)	(1,122)	(1)
32	ADA bn, Chap/Vulc, SP.....	44-325G	6.91	5.61	4,760	2,119	740	735	9,570	3,930	15,070	6,784	5
33	HHB.....	44-326G	(0.79)	(1.13)	(556)	(473)	(120)	(145)	(810)	(690)	(1,486)	(1,308)	(1)
34	2 ADA btry, Vulc, SP (each).....	44-327G	(1.44)	(0.87)	(982)	(319)	(150)	(115)	(2,280)	(720)	(3,412)	(1,154)	(1)
35	2 ADA btry, Chap, SP (each).....	44-328G	(1.62)	(1.73)	(1,120)	(504)	(160)	(180)	(2,100)	(900)	(3,380)	(1,584)	(1)
36	DISCOM.....	29-1G	17.76	21.40	16,420	9,358	3,180	2,280	97,632	35,116	117,456	46,530	16
37	HHC and band.....	29-2G	(0.28)	(0.56)	(250)	(208)	(50)	(70)	-----	-----	(300)	(278)	(1)
38	Admin co.....	12-37G	(0.33)	(1.04)	(300)	(424)	(60)	(130)	-----	-----	(360)	(554)	(2)
39	Med bn.....	8-35G	(2.37)	(3.73)	(2,150)	(1,862)	(430)	(730)	-----	-----	(2,580)	(2,592)	(3)
40	HQ and spt co.....	8-36G	(1.05)	(1.60)	(950)	(578)	(190)	(220)	-----	-----	(1,140)	(798)	-----
41	3 med co (each).....	8-37G	(0.44)	(0.71)	(400)	(428)	(80)	(170)	-----	-----	(480)	(598)	(1)
42	S&T bn.....	29-5G	(7.43)	(2.91)	(6,860)	(1,154)	(1,330)	(410)	(95,000)	(32,000)	(103,000)	(34,064)	(4)
43	HHC.....	29-5G	(0.17)	(0.77)	(150)	(280)	(30)	(100)	-----	-----	(180)	(380)	-----
44	S&S co.....	10-7G	(1.16)	(1.58)	(1,060)	(592)	(210)	(230)	(47,500)	(30,000)	(48,770)	(30,822)	(2)
45	TMT co.....	55-88G	(6.10)	(0.56)	(5,650)	(282)	(1,090)	(80)	(47,500)	(2,500)	54,240	(2,862)	(2)
46	Maint bn.....	29-15G	(7.35)	(13.16)	(6,860)	(5,710)	(1,310)	(940)	(2,632)	(2,616)	(11,026)	(9,042)	(6)
47	HQ and main spt co.....	29-16G	(2.69)	(4.05)	(2,530)	(1,785)	(480)	(310)	(720)	(480)	(3,730)	(2,575)	(3)
48	3 fwd spt co (each).....	29-17G	(1.12)	(2.66)	(1,040)	(1,130)	(200)	(165)	(600)	(600)	(1,840)	(1,895)	(1)
49	Trans acft maint co.....	55-89G	(1.30)	(1.13)	(1,210)	(535)	(230)	(135)	(112)	(336)	(1,776)	(782)	-----
50	Total.....		74.30	139.70	59,996	48,875	10,230	10,090	141,591	61,081	212,041	119,822	72

Table 5-17. Infantry Division (Mechanized) Base (TOE 37G)—Fuel Data

Table 1-1. <i>Engineering Division (Mechanized) Data (TOE SIG)—Fuel Data</i>														
1	1	2	3	4	5	6	7	8	9	10	11	12	13	
	Unit	TOE	Fuel to move 1 km (gal)		Fuel cap (gal)									kitchens
					Veh tks		Gas cans		Bulk fuel		Total fuel cap			
			Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas		
2	HHC.....	37-4G	0.70	3.13	540	1,381	60	295	479	1,221	1,079	2,897	2	
3	MP co.....	19-27G	0.17	2.39	150	909	30	285	-----	-----	180	1,194	1	
4	Sig bn.....	11-35G	4.80	6.74	4,350	2,446	870	920	1,438	962	6,658	4,328	5	
5	HHD.....	11-36G	(0.44)	(0.63)	(400)	(269)	(80)	(85)	(1,438)	(962)	(1,918)	(1,316)	-----	
6	Co co.....	11-37G	(1.60)	(1.81)	(1,450)	(649)	(290)	(245)	-----	-----	(1,740)	(894)	(2)	

Table 5-17—Continued

1	2													13
	Unit	TOE	Fuel to move 1 km (gal)		Fuel cap (gal)								kitchens	
			Diesel	Gas	Veh tks		Gas cans		Bulk fuel		Total fuel cap			
			Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas		
7	Fwd comm co.....	11-38G	(1.27)	(2.56)	(1,150)	(903)	(230)	(355)	-----	-----	(1,380)	(1,258)	(1)	
8	Sig op co.....	11-39G	(1.49)	(1.74)	(1,350)	(625)	(270)	(235)	-----	-----	(1,620)	(860)	(2)	
9	Engr bn.....	5-145G	10.72	23.63	5,666	10,223	480	1,140	5,432	13,648	11,578	25,011	7	
10	HHC.....	5-146G	(4.71)	(7.36)	(1,310)	(3,291)	(200)	(450)	(5,432)	(13,648)	(6,942)	(17,389)	(2)	
11	4 engr co (each).....	5-147G	(1.28)	(3.59)	(900)	(1,515)	(30)	(135)	-----	-----	(930)	(1,650)	(1)	
12	Brg co.....	5-148G	(0.89)	(1.91)	(756)	(872)	(160)	(150)	-----	-----	(916)	(1,022)	(1)	
13	3 bde HHC (each).....	37-42G	1.86	3.13	1,340	1,176	60	190	1,599	1,401	2,999	2,767	1	
14	Armd cav sqdn.....	17-105G	7.00	53.01	5,230	13,657	670	380	(6,069)	2,331	17,259	17,878	6	
15	HHT.....	17-106G	(4.86)	(3.32)	(3,514)	(1,349)	(510)	(250)	(6,069)	(2,331)	(10,093)	(3,930)	(2)	
16	3 armd cav trp (each).....	17-107G	(0.47)	(16.42)	(370)	(4,045)	(10)	(25)	-----	-----	(380)	(4,070)	(1)	
17	Air cav trp.....	17-108G	(0.73)	(0.43)	(606)	(173)	(130)	(55)	*(5,290)	*(1,510)	(6,026)	(1,738)	(1)	
18	Div arty.....	6-300G	88.18	27.61	37,724	10,371	2,770	3,150	12,380	4,800	52,874	18,321	24	
19	HHB.....	6-302G	(0.84)	(3.31)	(728)	(1,177)	(140)	(405)	(380)	(1,200)	(1,248)	(2,782)	(1)	
20	3 FA bn, 155-mm, SP (each).....	6-365G	(22.15)	(4.02)	(9,258)	(1,512)	(600)	(540)	(3,000)	(600)	(12,858)	(2,652)	(5)	
21	HHB.....	6-366G	(1.52)	(2.05)	(1,040)	(764)	(40)	(270)	-----	-----	(1,080)	(1,034)	(1)	
22	3 FA btry (each).....	6-367G	(5.76)	(0.52)	(1,944)	(188)	(90)	(70)	-----	-----	(2,034)	(258)	(1)	
23	Svc btry.....	6-369G	(3.35)	(0.41)	(2,386)	(184)	(290)	(60)	(3,000)	(600)	(5,676)	(844)	(1)	
24	FA bn, 155-mm/8-in., SP.....	6-355G	(19.95)	(5.32)	(8,394)	(1,974)	(670)	(555)	(2,400)	(1,200)	(11,464)	(3,729)	(5)	
25	HQ, H&S btry.....	6-356G	(2.73)	(3.54)	(1,974)	(1,309)	(250)	(310)	(2,400)	(1,200)	(4,624)	(2,819)	(1)	
26	3 FA btry, 155-mm, SP (each).....	6-357G	(4.44)	(0.39)	(1,314)	(137)	(90)	(55)	-----	-----	(1,404)	(192)	(1)	
27	FA btry, 8-in., SP.....	6-358G	(3.90)	(0.61)	(2,478)	(254)	(150)	(80)	-----	-----	(2,628)	(334)	(1)	
28	FA bn, HJ.....	6-175G	(0.94)	(6.92)	(828)	(2,684)	(160)	(570)	(600)	(600)	(1,588)	(3,854)	(3)	
29	HHB.....	6-176G	(0.50)	(1.96)	(428)	(750)	(80)	(260)	(600)	(600)	(1,108)	(1,610)	(1)	
30	2 FA btry (each).....	6-177G	(0.22)	(2.48)	(260)	(967)	(40)	(155)	-----	-----	(240)	(1,122)	(1)	
31	ADA bn, Chap/Vulc, Sp.....	44-325G	6.91	5.61	4,760	2,119	740	735	9,570	3,930	15,070	6,784	5	
32	HHB.....	44-326G	(0.79)	(1.13)	(566)	(473)	(120)	(145)	(810)	(690)	(1,486)	(1,308)	(1)	
33	2 ADA btry, Vulc, SP (each).....	44-327G	(1.44)	(0.87)	(982)	(319)	(150)	(115)	(2,280)	(720)	(3,412)	(1,154)	(1)	
34	2 ADA btry, Chap, SP (each).....	44-328G	(1.62)	(1.37)	(1,120)	(504)	(160)	(180)	(2,100)	(900)	(3,380)	(1,584)	(1)	
35	DISCOM.....	29-11G	19.07	24.67	17,710	10,930	3,350	2,610	162,164	36,296	183,224	49,836	16	
36	HHC and band.....	29-2G	(0.28)	(0.56)	(250)	(208)	(50)	(70)	-----	-----	(300)	(278)	(1)	
37	Admin co.....	12-37G	(0.33)	(1.04)	(300)	(424)	(60)	(130)	-----	-----	(360)	(554)	(2)	
38	Med bn.....	8-35G	(2.37)	(3.73)	(2,150)	(1,862)	(430)	(730)	-----	-----	(2,580)	(2,592)	(3)	
39	HQ and spt co.....	8-36G	(1.05)	(1.60)	(950)	(578)	(190)	(220)	-----	-----	(1,140)	(798)	-----	
40	3 med co (each).....	8-37G	(0.44)	(0.71)	(400)	(428)	(80)	(170)	-----	-----	(480)	(598)	(1)	
41	S&T bn.....	29-65G	(8.90)	(3.62)	(8,260)	(1,439)	(1,590)	(505)	(157,567)	(32,733)	(167,417)	(34,677)	(4)	
42	HHC.....	29-6G	(0.17)	(0.77)	(150)	(280)	(30)	(100)	-----	-----	(180)	(380)	-----	
43	S&S co.....	10-7G	(1.16)	(1.58)	(1,060)	(592)	(210)	(230)	(47,500)	(30,000)	(48,770)	(30,882)	(2)	
44	TMT co.....	55-87G	(7.25)	(0.57)	(6,750)	(282)	(1,290)	(80)	(107,200)	-----	(115,240)	(362)	(2)	
45	Div avn spt det.....	1-87G	(0.32)	(0.70)	(300)	(285)	(60)	(95)	(2,867)	(2,733)	(3,227)	(3,113)	-----	
46	Maint bn.....	29-25G	(7.19)	(15.72)	(6,750)	(6,997)	(1,220)	(1,175)	(4,597)	(3,563)	(12,567)	(11,735)	(6)	
47	HQ and main spt co.....	29-26G	(2.09)	(6.19)	(1,930)	(2,821)	(290)	(470)	(483)	(717)	(2,703)	(4,008)	(3)	
48	3 fwd spt co (each).....	29-27G	(1.36)	(2.84)	(1,290)	(1,236)	(250)	(195)	(622)	(578)	(2,162)	(2,009)	(1)	
49	Trans acft maint co.....	55-424G	(1.02)	(1.01)	(950)	(468)	(180)	(120)	(2,248)	(1,112)	(2,378)	(1,700)	-----	
50	Total.....		143.13	156.18	80,150	55,564	9,150	10,085	202,329	67,391	296,919	134,550	69	

*Not included in totals. Unit bulk capacity of 6,800 gallons used to carry JP-4 fuel for organic helicopters.

Table 5-18. Combat Units—Fuel Data

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Table 5-19. Combat Support Units—Fuel Data

1	1	2	3	4	5	6	7	8	9	10	11	12	13
	Unit	TOE	Fuel to move 1 km (gal)		Fuel cap (gal)								kitchens
			Diesel	Gas	Veh tks		Gas cans		Bulk fuel		Total fuel cap		
					Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas	
FA units													
2	HHB, FA gp-----	6-401G	0.33	2.10	300	732	60	280	-----	-----	360	1,012	1
3	FA bn, 155-mm, towed-----	6-425G	5.82	3.66	4,170	1,369	610	495	2,400	1,200	7,180	3,064	5
4	HHB-----	6-426G	(0.17)	(1.97)	(150)	(727)	(30)	(265)	-----	-----	(180)	(992)	(1)
5	3 FA btry (each)-----	6-427G	(1.33)	(0.41)	(930)	(147)	(130)	(55)	-----	-----	(1,060)	(202)	(1)
6	Svc btry-----	6-429G	(1.66)	(0.46)	(1,230)	(201)	(190)	(65)	(2,400)	(1,200)	(3,820)	(1,466)	(1)
7	FA bn, 175-mm, SP-----	6-435G	12.62	3.89	8,334	1,461	570	525	1,800	600	10,704	2,586	5
8	HHB-----	6-436G	(0.17)	(2.29)	(150)	(840)	(30)	(310)	-----	-----	(180)	(1,150)	(1)
9	3 FA btry (each)-----	6-437G	(3.44)	(0.38)	(2,202)	(140)	(110)	(50)	-----	-----	(2,312)	(190)	(1)
10	Svc btry-----	6-439G	(2.31)	(0.46)	(1,578)	(201)	(210)	(65)	(1,800)	(600)	(3,588)	(866)	(1)
11	FA bn, 8-in., SP-----	6-445G	12.13	6.15	8,080	2,377	580	680	1,800	600	10,460	3,657	5
12	HHB-----	6-416G	(0.17)	(2.43)	(150)	(888)	(30)	(340)	-----	-----	(180)	(1,228)	(1)
13	3 FA btry (each)-----	6-447G	(3.53)	(0.67)	(2,302)	(281)	(130)	(85)	-----	-----	(2,432)	(366)	(1)
14	Svc btry-----	6-449G	(1.37)	(1.71)	(1,024)	(646)	(160)	(85)	(1,800)	(600)	(2,984)	(1,331)	(1)
15	FA bn, 155-mm, SP-----	6-455G	14.68	3.34	6,992	1,240	500	450	4,200	1,200	11,692	2,890	5
16	HHB-----	6-456G	(0.66)	(1.93)	(390)	(694)	(30)	(260)	-----	-----	(420)	(954)	(1)
17	3 FA btry (each)-----	6-457G	(4.02)	(0.34)	(1,710)	(123)	(90)	(45)	-----	-----	(1,800)	(168)	(1)
18	Svc btry-----	6-459G	(1.96)	(0.39)	(1,472)	(177)	(200)	(55)	(4,200)	(1,200)	(5,872)	(1,432)	(1)
19	FA det HQ tm (AA)-----	6-500G	-----	0.25	-----	126	-----	40	-----	-----	-----	166	-----
20	Maint and assy tm, HJ (EA)-----	6-500G	0.12	0.16	78	74	10	20	-----	-----	88	94	-----
21	Maint and assy tm, SGT (EB)-----	6-500G	0.06	0.07	50	24	10	10	-----	-----	60	34	-----

Table 5-19—Continued

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	Unit	TOE	Fuel to move 1 km (gal)		Fuel cap (gal)								kitchens	
			Diesel	Gas	Veh tks		Gas cans		Bulk fuel		Total fuel cap			
					Diesel	Gas	Diesel	Gas	Diesel	Gas	Diesel	Gas		
22	Maint and assy tm, PERSH (EC) -----	6-500G	0.12	0.07	78	24	10	10	-----	88	34	-----		
23	Maint and assy tm, cannon (ED) -----	6-500G	-----	0.16	-----	74	-----	20	-----	94	-----			
24	FA scety tm, HJ (FA) -----	6-500G	-----	0.11	-----	41	-----	15	-----	56	-----			
25	FA scety tm, SGT (FB) -----	6-500G	-----	0.11	-----	41	-----	15	-----	56	-----			
26	FA scety tm, PERSH (FC) -----	6-500G	-----	0.11	-----	41	-----	15	-----	56	-----			
27	FA scety tm, cannon (FD) -----	6-500G	-----	0.11	-----	41	-----	15	-----	56	-----			
28	FA comm tm (GA) -----	6-500G	-----	0.22	-----	82	-----	30	-----	112	-----			
29	FA med aid sta tm (HA) -----	6-500G	-----	0.14	-----	48	-----	20	-----	68	-----			
30	FA amb dtl tm (HB) -----	6-500G	-----	0.07	-----	24	-----	10	-----	34	-----			
31	HHB, corps arty -----	6-501C	0.66	3.08	600	1,165	120	425	-----	600	720	2,190	1	
32	HHB, abn corps arty -----	6-502G	0.33	2.83	300	1,022	60	400	-----	600	360	2,022	1	
33	FA bn, HJ -----	6-525G	1.51	9.60	1,306	3,703	250	895	600	1,800	2,156	6,398	4	
34	HQ, H & S btry -----	6-526G	(0.67)	(2.16)	(556)	(829)	(100)	(295)	(600)	(1,800)	(1,256)	(2,924)	(1)	
35	3 FA btry (each) -----	6-527G	(0.28)	(2.48)	(250)	(958)	(50)	(200)	-----	(300)	(1,158)	(1)		
36	FA bn, SGT -----	6-555G	3.39	5.82	3,054	2,536	450	800	3,000	2,400	6,504	5,736	3	
37	HQ, H&S btry -----	6-556G	(1.35)	(3.76)	(1,218)	(1,656)	(190)	(500)	(600)	(1,200)	(2,008)	(3,356)	(1)	
38	2 FA btry (each) -----	6-557G	(1.02)	(1.03)	(918)	(440)	(130)	(150)	(1,200)	(600)	(2,248)	(1,190)	(1)	
39	FA btry, slt -----	6-558G	0.17	3.01	150	1,087	30	405	-----	600	180	2,092	1	
40	FATAB -----	6-575G	2.32	10.42	2,078	4,225	420	1,415	2,180	2,180	4,678	7,820	5	
41	HHB -----	6-576G	(1.00)	(2.31)	(878)	(901)	(180)	(305)	(2,180)	(2,180)	(3,238)	(3,386)	(2)	
42	3 FA btry (each) -----	6-577G	(.44)	(2.82)	(400)	(1,111)	(80)	(370)	-----	(480)	(1,480)	(2)		
43	FA bn, PERSH -----	6-615G	28.45	10.65	22,302	4,056	4,980	1,420	33,620	31,620	60,402	37,096	12	
44	HHB -----	6-616G	(1.91)	(1.72)	(1,430)	(622)	(330)	(240)	(4,680)	(4,680)	(8,120)	(5,542)	(2)	
45	4 FA btry (each) -----	6-617G	(5.14)	(1.68)	(4,050)	(637)	(880)	(225)	(4,680)	(4,680)	(19,210)	(5,542)	(2)	
46	Svc btry -----	6-619G	(5.64)	(2.13)	(4,274)	(836)	(980)	(280)	(4,680)	(4,680)	(10,014)	(5,796)	(3)	
ADA units														
47	HHB, ADA bde -----	44-2G	0.66	0.67	600	249	120	85	1,059	441	2,220	334	1	
48	ADA tgt det -----	44-8G	0.06	0.27	50	115	10	35	-----	60	150	-----		
49	HHB, ADA gp -----	44-12G	4.51	0.53	500	201	100	65	1,070	430	2,100	266	-----	
50	ADA AW bn, SP -----	44-85G	3.80	23.73	3,282	9,894	610	310	5,885	16,735	9,777	26,939	5	
51	HHB -----	44-86G	(1.6)	(0.81)	(1,282)	(334)	(210)	(110)	(2,521)	(659)	(4,013)	(1,103)	(1)	
52	4 ADA btry (each) -----	44-87G	(0.55)	(5.73)	(500)	(2,390)	(100)	(50)	(841)	(4,019)	(1,441)	(6,459)	(1)	
53	ADA bn, HAWK -----	44-235G	7.83	3.75	7,100	1,553	1,420	515	25,834	5,966	34,354	8,034	5	
54	HHB -----	44-236G	(0.99)	(1.47)	(900)	(585)	(180)	(195)	(3,854)	(2,506)	(4,934)	(3,286)	(1)	
55	4 ADA btry (each) -----	44-237G	(1.71)	(0.57)	(1,550)	(242)	(310)	(80)	(5,495)	(865)	(7,355)	(1,187)	(1)	
56	ADA bn, HERC -----	44-535G	4.36	11.81	3,756	7,050	780	910	18,670	13,490	23,196	21,450	5	
57	HHB -----	44-536G	(2.80)	(10.81)	(2,356)	(6,682)	(500)	(790)	(3,294)	(9,326)	(6,140)	(16,898)	(1)	
58	4 ADA btry (each) -----	44-537G	(0.39)	(0.25)	(350)	(92)	(70)	(30)	(3,844)	(1,016)	(4,264)	(1,138)	(1)	

Section III. CLASS V SUPPLY

5-8. Ammunition Service

a. Ammunition service encompasses the supply and maintenance of conventional and special ammunition, the class V and VII items peculiar to ammunition, and the maintenance of guided-missile systems. It also includes the specialized services closely associated with ammunition, e.g., escort, calibration, and disposal. The scope of ammunition service will vary widely with the type of conflict and with the operational environment in which U.S. forces fight. In peacetime, ammunition service is primarily a maintenance function. During wartime, the tactical arms must fight for protracted periods with the ammunition that is "on the ground." The capability of fighting is related directly to the adequacy of planning ammunition stockage levels and the serviceability of these stocks at the beginning of hostilities.

b. Subsequent paragraphs cover the interrelationships of ammunition service and tactics, the factors that govern the establishment and adjustment of ammunition supply levels, and basic information on ammunition supply and maintenance procedures. They should provide an insight into ammunition service and promote understanding among tactical and ammunition service commanders.

c. Tables in this section contain logistic planning data for conventional ammunition pertaining to —

(1) Combat vehicle ammunition data (table 5-20).

(2) Estimated expenditures of ammunition.

(a) Ammunition per weapon per day, expressed in rounds (table 5-21).

(b) Ammunition per type of unit per day, expressed in short tons (STON) (table 5-22).

(3) Field artillery ammunition expenditures.

(a) Expenditures in rounds per weapon per hour (table 5-23).

(b) Expenditures in STON per battalion per hour (table 5-24).

(4) Basic load.

(a) Ammunition basic load guide (table 5-25).

(b) Basic load of ammunition — example for an infantry unit (table 5-26).

(c) Basic load of ammunition — example for an artillery unit (table 5-27).

(d) Above examples are computed by applying the basic load guide (table 5-25) and the weights of ammunition to the weapon densities

appropriate to each table of organization and equipment (TOE) unit.

d. FM 101-10-3 contains logistic data on special ammunition. FM 9-6 contains details on supply, maintenance, and other aspects of ammunition services.

e. SB 38-26 contains details on estimated *average* quantity of ammunition required per day to sustain operations in an active combat theater. AR 11-12 contains details on days of supply authorized oversea commands. These references, together with personnel and weapon densities, establish the level of ammunition reserves authorized during the prehostilities phase; and, insofar as they reflect a level of available assets, they constitute the upper limit of planned expenditures in the initial phases of conflict, at least until resupply can be accomplished. For tactical planning, the consumption rates (expenditures) covered in paragraphs 5-15 and 5-16 should be used.

f. Interrelationships of tactics and ammunition service. Ammunition directly influences tactical operations; therefore, tactical commanders must plan their operations and commit their forces with full awareness of the support capabilities of the ammunition service support structure. Likewise, combat service support commanders must establish, stock, and employ ammunition service units with full awareness of the operational plans of the supported tactical commanders. An imbalance of either tactics or ammunition service may decisively influence operations. Thus, both tactical and combat service support commanders must consider tactics and ammunition service, not as individual entities, but as an inseparable unity that requires maximum attention, cooperation, and coordination.

5-9. Ammunition Supply Levels

Levels of ammunition supply normally are expressed as days of supply for each theater of operations and for major commands in each theater. These supply levels are established initially in accordance with references given in paragraph 5-8e and special authorization for support of contingency plans. Available ammunition assets are then announced as available supply rates (ASR). As tactical experience is gained, the required supply rate (RSR) is computed. The ammunition logistic system relates ammunition (ASR) to the consumption or planned consumption (RSR) so that the desired balance of reserves on hand can be maintained. Therefore, above average consumption by one part of the force

tends to be balanced by limiting the consumption of another part of the force. Major commanders will desire to maintain a planned level of supply as the minimum acceptable level of reserves. To change this level of supply by increasing the level of receipts requires a planning leadtime which may be in excess of tactical and operational planning leadtime. Factors that cause this long leadtime are procurement and production, order and shipping time, type and quantity of transportation available, storage space in a theater, physical security forces available to protect shipments and storage areas, and the extent of control over the tactical situation.

5-10. Ammunition Service at DS Level

Current ammunition service includes one major change from previous systems, including combat service to the Army (COSTAR) — conventional and special ammunition are combined at the DS level and split at the GS level. Special ammunition supply points (SASP) stock all ammunition for nuclear-capable missile firing units, whereas ammunition supply points (ASP) store conventional and special ammunition for all other tactical units in the division area of the combat zone.

a. The ordnance special ammunition DS company (TOE 9-47G) will supply all the special and conventional ammunition required in support of nuclear-capable missile firing units.

b. Explosive ordnance disposal (EOD) service is requested through rear area protection (RAP) channels. The RAP centers place requirements on the EOD control detachment, which, in turn, directs the appropriate disposal detachment to take necessary action.

c. Ammunition maintenance support is provided by the special ammunition supply company, mobile, for conventional and special ammunition items, less missile bodies (less explosive components) for nuclear-capable missile firing units. The DS support for missile bodies is provided by the firing unit's organic maintenance element. As required, missile maintenance support may be augmented by the rockets and missile support detachments (TOE 9-550T).

5-11. Ammunition Service at GS Level

At the GS level, conventional and special ammunition are stored separately. The location of ASP's and SASP's in corps and field army areas depends on the location of DS supply points, the tactical situation, and the necessity for dispersion; this location is independent of corps rear boundaries. The following units perform GS functions:

a. The ordnance conventional ammunition company, DS/GS (TOE 9-38G), and the ordnance special ammunition company, DS/GS (TOE 9-38G) respectively, with assistance from the guided missile GS company (TOE 9-59G), perform repair of unserviceable ammunition and explosive components of missiles.

b. The ordnance special ammunition company, DS/GS (TOE 9-48G), performs repair of unserviceable special ammunition for return to stock. The ammunition company, conventional (TOE 9-38G), repairs unserviceable conventional ammunition for return to stock.

c. The ordnance company, guided missile GS maintenance (TOE 9-59G), and the rockets and missile support detachments (TOE 9-550T) provide maintenance of guided missile systems, less explosive components.

d. The aircraft and missile repair parts supply company, GS (TOE 29-129), provides repair parts support (less repair parts peculiar to special ammunition and explosive components) for large rockets and large guided missile systems to both DS and GS guided missile maintenance units.

5-12. Conventional Ammunition Supply System

Conventional ammunition supply in the field army generally is based on a continuous refill system. Tactical units are responsible for maintaining a basic load of ammunition at all times. Replenishment of ammunition expended by units is either concurrent with an immediate requirement or in expectation of a requirement. Withdrawals from ASP's are replenished by shipments from the COMMZ or from combat zone depots. The theater army commander prescribes stock levels to be maintained in field army ammunition installations and COMMZ depots. A system of credits controls ammunition to the field army, and the field army commander makes suballocations to the corps and the corps commander further suballocates to the division. The allocation of credits in COMMZ depots to field armies, the timely submission of RSR's, the announcement of ASR's by all commanders, the continuous refill system whereby units maintain their basic loads at prescribed levels, and a system of ammunition reports provide the extent of control that the situation requires. The procedures for supply and stock control of conventional ammunition involve the basic load, the RSR, the ASR, and the functions of major command ammunition officers as well as staff responsibilities of the G3 (S3) and the G4 (S4). The combat service support system provides the means for timely integration of these control

factors. (FM 9-6 and AR 310-25 provide definitions and details.)

5-13. Special Ammunition Supply System

The basic load and automatic resupply system that applies to conventional ammunition is not applicable to special ammunition. Special ammunition service in the field is based on special ammunition stockages, special ammunition loads (SAL), and an allocation system. (AR 310-25 defines these terms.) Commanders receive allocations of special ammunition by specific item for a specific time or a specific action. The special ammunition logistic element (SALE) at theater army, field army, and corps coordinates all special ammunition logistic support matters within each of these headquarters. Commanders prescribe the distribution of available weapons to include ownership, storage units, location, type of weapons, yields, and total numbers. The principles of the Army Field Stock Control System (AR 711-16) govern stockage of class VII items peculiar to special ammunition. FM 9-6 contains details on special ammunition supply and control.

5-14. Combat Vehicle Ammunition Data

a. Table 5-20 provides background material for the tables in paragraphs 5-15 and 5-16. Table 5-20 breaks out weapons from the principal item, the combat vehicle, and lists the ammunition carried in the typical division, both on the vehicle and in division trains, to support each weapon. Figures in columns 6, 7, and 8 are included in the basic load. Figures in other columns average out in the basic load for the weapon concerned, considering that any one weapon may vary among the different TOE units to which specific basic loads apply.

b. In table 5-20, data sources for distribution of weapon per combat vehicle are TM 9-500

and FM 101-20, and for rounds per weapon USCONARC Regulation 700-3, *Logistics — Basic Load Ammunition Supply Data*.

5-15. Estimated Expenditures of Ammunition

a. Table 5-21 shows estimated rounds of ammunition per weapon per day expected for or attributed to different types of combat for conventional conflict. This table and table 5-22 are based on the relationships of types of combat to one another, the rounds available per weapon in the basic loads, the weighting of rounds according to the mission of each division and supporting corps artillery, the units involved in the 1965-70 time frame, and the weapons assigned table of organization and equipment (TOE) G-series units. This table does not include consideration of close air support.

b. Table 5-22 shows the STON per day of ammunition used per division or corps artillery battalion, based on the number of rounds computed from table 5-21. The first day's expenditure of ammunition for the grenade launcher and recoilless rifles equals the basic load. This table does not include consideration of close air support.

5-16. Field Artillery Ammunition Expenditures

a. Table 5-23 shows the average rate of expenditure per weapon per hour of various types of artillery rounds in division and corps units. Figures in column 6 represent the support of ground divisional and nondivisional maneuver units.

b. Table 5-24 shows the STON expended per hour by division and corps artillery battalions. The figures in columns 2, 3, and 5 are derived from World War II experience and will require modification to fit current weapons and tactics. Figures in column 6 represent the support of ground divisional and nondivisional maneuver units.

Table 5-20. Combat Vehicle Ammunition Data

1955-56-57 General Vehicle Transportation Data																				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		
1	Line item number	Armt	Misc stowage	Rd per veh	Ammo															
					Cbt veh	Prin wpm	Mg, cal 7.62-mm, lt, flex, M60	Mg, cal .50	Gren per veh	Flares, sig, gnd, per veh	Misc per veh	Prin wpm	Mg, cal 7.62-mm, lt, flex, M60	Smg, cal .45	Mg, cal .50	Ammo stowage (rd per veh)			Rd per veh in tns	
																Mg, cal 7.62-mm lt, flex, M60	Smg, cal .45	Mg, cal .50	Prin wpm	Mg, cal 7.62-mm lt, flex, M60	Mg, cal .50
2	A90117	Armt subsys, hel, 7.62-mm mg, lt, M23.	-----	2	-----	-----	-----	-----	4,200	-----	-----	1,200	-----	-----	3,000	-----	-----	-----		
3	A90154	Armt subsys, hel, 7.62-mm mg, high-rate, XM27.	-----	1	-----	-----	-----	-----	4,500	-----	-----	1,500	-----	-----	3,000	-----	-----	-----		
4	A90186	Armt subsys, hel, 7.62-mm mg, twin, M2.	-----	2	-----	-----	-----	-----	6,500	-----	-----	1,300	-----	-----	5,200	-----	-----	-----		
5	A90323	Armt subsys, hel, 7.62-mm mg, M6.	-----	4	-----	-----	-----	-----	21,600	-----	-----	7,200	-----	-----	14,400	-----	-----	-----		
6	A90426	Armt subsys, hel, 7.62-mm mg/2.75-in RL, high-rate, M21.	2.75- in RL	1	-----	-----	-----	42	21,000	-----	-----	14	6,000	-----	28	15,000	-----	-----		
7	A90460	Armt subsys, hel, 40-mm GL, M5.	40-mm GL	-----	-----	-----	-----	321	-----	-----	-----	107	-----	-----	214	-----	-----	-----		
8	A90597	Armt subsys, hel, 2.75-in RL, XM3.	2.75- in RL	-----	-----	-----	-----	192	-----	-----	-----	48	-----	-----	144	-----	-----	-----		
9	A90871	Armt subsys, hel, GM lchr, M22.	GM lchr	-----	-----	-----	-----	36	-----	-----	-----	6	-----	-----	30	-----	-----	-----		
10	D10725	Carr, 81-mm mort, FTRAC, M125A1.	81-mm mort	-----	1	8 hand	10	-----	155	-----	2,000	120	-----	600	35	-----	1,400	-----		
11	D10740	Carr, 107-mm mort, SP, M106A1.	107-mm mort	1	1	8 hand	10	-----	163	-----	180	2,000	93	3,000	180	600	70	-----		
12	D11401	Carr, comd and recon, armd, M114.	-----	1	1	8 hand	12	-----	3,520	---	1,400	---	2,640	---	1,000	---	880	400		
13	D12086	Carr, pers, FTRAC, armd, M113A1.	-----	1	20 hand	12	-----	-----	180	1,800	-----	180	1,800	-----	180	2,100	-----	-----		
14	D12086	Carr, pers, FTRAC, armd, M113.	-----	1	20 hand	12	-----	-----	180	2,100	-----	180	2,100	-----	180	2,100	-----	-----		
15	E56577	CEV, FTRAC, M728.	165-mm DM1 gun	1	1	8	10	-----	30	3,410	---	735	30	3,410	---	735	-----	-----		
16	J96819	Gun, antiaircraft arty, SP, 40-mm, M42A1.	40-mm gun	1	---	8 hand	-----	66-mm rkt, 4 rd	720	2,000	-----	480	1,750	-----	240	250	-----	-----		
17	J96956	Gun, at, SP, 90-mm, M56.	90-mm gun	-----	---	8 hand	-----	-----	29	-----	-----	29	-----	-----	-----	-----	-----	-----		
18	J97230	Gun, FA, SP, 175-mm, M107.	175-mm gun	-----	---	8	10	-----	114	-----	-----	2	-----	-----	112	-----	-----	-----		
19	K56981	How, hv, SP, 8-in, M110.	8-in how	-----	---	8 hand	10	-----	100	-----	-----	2	-----	500	98	-----	-----	-----		
20	K57255	How, lt, SP, 105-mm, M108.	105-mm how	-----	1	10 hand	12	-----	250	-----	1,100	87	-----	900	163	-----	200	-----		

Table 5-20—Continued

Table 5-15 Continued																																					
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19	
1	Line item number	Armt										Misc stowage		Rd per veh				Ammo						Rd per veh in tns													
		Cht veh		Prin wpn	Mg, cal 7.62-mm, lt, flex, M60	Mg, cal .50	Gren per veh	Flares, sig, gnd, per veh	Misc per veh	Prin wpn	Mg, cal 30/ 7.62-mm, lt, flex, M60	Smg, cal .45	Mg, cal .50	Ammo stowage (rd per veh)				Rd per veh in tns																			
														Prin wpn	Mg, cal 30/ 7.62-mm lt, flex, M60	Smg, cal .45	Mg, cal .50	Prin wpn	Mg, cal 30/ 7.62-mm lt, flex, M60	Smg, cal .45	Mg, cal .50																
21	K57666	How, mdm, SP, 155-mm, M109.		155-mm how	-----	1	8 hand	10	66-mm rkt, 10 rd	150	-----	600	28	-----	500	122	-----	100																			
22	R50543	Recov veh, FTRAC, lt, armd, M578.		-----	-----	1	8 hand	16	-----	-----	-----	600	-----	-----	500	-----	-----	100																			
23	R50680	Recov veh, FTRAC, mdm, M88.		-----	-----	1	8 hand	12	3.5-in rkt, 10 rd	-----	-----	180	1,600	-----	180	1,500	-----	-----	100																		
24	V12826	Tk, cbt, FTRAC, 76-mm gun, M41A3.		76-mm gun	1	1	8 hand	12	-----	70	6,000	180	700	65	5,000	180	620	5	1,000	100																	
25	V12963	Tk, cbt, FTRAC, 90-mm gun, M48A2.		90-mm gun	1	1	8 hand	12	-----	62	5,940	360	630	62	5,940	360	630	-----	-----																		
26	V13100	Tk, cbt, FTRAC, 105-mm gun, M60A1.		105-mm gun	1	1	8 hand	12	-----	78	6,500	360	1,260	63	5,000	360	900	15	1,500	360																	
27	V13237	Tk, cbt, FTRAC, 120-mm gun, M103A2.		120-mm gun	2	1	-----	-----	-----	43	8,850	300	525	38	5,240	300	1,000	5	3,610	-----																	

Table 5-21. Ammunition Per Weapon Per Day, Expressed in Rounds

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Weapon	Type of combat													
		Attack of position					Covering and security force action	Defense of position		Inactive situation	Meeting engagement	Pursuit	Retirement or delaying action	Assault of hostile shore	Protracted period
		Permanent fortifications		Deliberately organized		Hastily organized		First day	Succeeding days						
		First day	Succeeding days	First day	Succeeding days										
2	Armt subsys, hel, 7.62-mm mg, twin, M2	1,083	650	1,083	591	788	650	1,300	788	263	650	135	464	788	329
3	Armt subsys, hel, 40-mm GL, M5	267	161	267	146	195	161	321	195	65	161	33	115	195	81
4	Armt subsys, hel, GM lchr, M22	30	18	30	16	22	18	36	22	7	18	4	13	22	9
5	Armt subsys, hel, 7.62-mm mg, lt, M23	700	420	700	382	509	420	840	509	170	420	87	300	509	213
6	Armt subsys, hel, 7.62-mm mg, high-rate, XM27	750	450	750	409	545	450	900	545	182	450	93	321	545	228
7	Guidance and launching sta (Entac)	13	8	13	7	9	8	15	9	3	8	2	5	9	4
8	Gun, mach, cal .50	219	132	219	120	159	132	263	159	53	132	27	94	159	67
9	Gun, mach, 7.62-mm	541	325	541	295	393	325	649	393	131	325	67	232	393	164
10	Gun, 175 mm, SP	95	57	95	52	69	-----	114	69	23	57	-----	-----	69	29
11	Gun, smg, cal .45	37	22	37	20	27	22	44	27	9	22	5	16	27	11
12	How, 105-mm, towed or SP	167	100	167	91	121	100	200	121	40	100	21	71	121	51
13	How, 155-mm, towed or SP	192	116	192	105	140	114	231	140	47	116	24	82	140	58
14	How, 8-in, towed or SP	119	72	119	65	87	72	143	87	29	72	-----	-----	87	36
15	Lchr, gren, 40-mm	27	16	27	15	19	16	32	19	6	16	3	11	19	8

Table 5-21—Continued

Table 3-31. Continued															
1	Weapon	1	2	4	5	6	7	8	9	10	11	12	13	14	15
		Type of combat													
		Attack of position					Covering and security force action	Defense of position		Inactive situation	Meeting engagement	Pursuit	Retirement or delaying action	Assault of hostile shore	Protracted period
		Permanent fortifications		Deliberately organized		First day		Succeeding days							
		First day	Succeeding days	First day	Succeeding days										
16	Lchr, rkt, 7.62-mm.....	5	3	5	3	4	3	6	4	1	3	1	2	4	2
17	Mort, 81-mm.....	121	73	121	66	88	73	145	88	29	73	15	52	88	37
18	Mort, 107-mm.....	136	82	136	74	99	82	163	99	33	82	17	58	99	41
19	Pistol, cal .45, auto.....	3	2	3	2	2	2	4	2	1	2	-----	1	2	1
20	Rifle, 5.56-mm.....	124	74	124	67	90	74	148	90	30	74	15	53	90	38
21	Rifle, 7.62-mm.....	47	29	47	26	35	29	57	35	12	29	6	20	35	14
22	Rifle, 7.62-mm, auto, with bipod.....	112	67	112	61	81	67	134	81	27	67	14	48	81	34
23	Rifle, rcl, 90-mm.....	15	9	15	8	11	9	18	11	4	9	2	6	11	5
24	Rifle, rcl, 106-mm.....	33	20	33	18	24	20	40	24	8	20	4	14	24	10
25	Tk, cbt, FTRAC, 76-mm gun.....	58	35	58	32	42	35	70	42	14	35	7	25	42	18
26	Tk, cbt, FTRAC, 90-mm gun.....	52	31	52	28	38	31	62	38	13	31	7	22	38	16
27	Tk, cbt, FTRAC, 105-mm gun.....	65	39	65	35	47	39	78	47	16	39	8	28	47	20

Table 5-22. Ammunition Per Type of Unit Per Day, Expressed in STON

Table 3-22. Performance for Types of Combat, by Day, Expressed in PCT.															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1	Unit	Type of combat													
		Attack of position					Covering and security force action	Defense of position		Inactive situation	Meeting engagement	Pursuit	Retirement or delaying action	Assault of hostile shore	Protracted period
		Permanent fortifications		Deliberately organized		Hastily organized		First day	Succeeding days						
		First day	Succeeding days	First day	Succeeding days										
2	Abn div.....	676	406	649	369	491	345	811	491	162	406	89	280	491	205
3	Armd div.....	2,145	1,287	2,059	1,170	1,560	1,095	2,574	1,560	515	1,287	281	888	1,560	651
4	Inf div.....	1,262	758	1,212	689	918	645	1,515	918	303	758	165	522	918	383
5	Inf div (mech).....	1,817	1,190	1,744	991	1,321	928	2,180	1,321	436	1,090	238	752	1,321	552
6	Corps arty, 155-mm bn.....	200	120	192	109	145	102	240	145	48	120	26	83	145	61
7	Corps arty, 8-in, bn.....	171	103	164	93	124	-----	205	124	41	103	-----	-----	124	52
8	Corps arty, 175-mm bn.....	98	59	94	54	72	-----	118	72	24	59	-----	-----	72	30
9	Corps arty, HJ bn.....	99	60	95	54	72	51	119	72	24	60	13	41	72	30

Table 5-23. Expenditures in Rounds Per Weapon Per Hour

1	Kind of fire or phase of action	2	3	4	5	6
		Average rate per weapon per hour				HJ
		105-mm	155-mm	175-mm	8-in.	
2	Advance guard action, development, and deployment.....	25	12	8	8	0.125
3	Preparation.....	80	25	28	25	0.75
	Supporting fires during the attack (including counterbattery):					
4	First 2 hours.....	50	25	28	25	0.5
5	After 2 hours.....	30	15	17	15	0.125
6	Exploitation, pursuit, delaying action, or delaying enemy development.....	25	12	16	12	0.5
7	Counterpreparation.....	60	25	28	25	0.125
8	Defensive fires against infantry attack (including counterbattery).....	50	25	28	25	0.5
9	Fortified position.....	50	25	28	25	0.125

Table 5-24. Expenditures in STON Per Battalion Per Hour

1	Kind of fire or phase of action	2	3	4	5	6
		Average rate per weapon per hour				HJ
		105-mm	155-mm	175-mm	8-in.	
2	Advance guard action, development, and deployment.....	11.02	12.35	9.96	9.96	2.25
3	Preparation.....	35.28	25.87	35.37	33.78	13.50
	Supporting fires during the attack (including counterbattery):					
4	First 2 hours.....	22.05	25.87	35.37	33.78	9.00
5	After 2 hours.....	13.22	15.52	21.55	20.00	2.25
6	Exploitation, pursuit, delaying action, or delaying enemy development.....	11.02	12.52	20.24	16.17	9.00
7	Counterpreparation.....	26.46	25.87	35.37	33.78	2.25
8	Defensive fires against infantry attack (including counterbattery).....	22.05	25.87	35.37	33.78	9.00

5-17. Ammunition Basic Load

a. To calculate the total weight of the ammunition basic load for a TOE unit, follow these steps:

(1) Prepare a table in outline with columnar headings as in table 5-26.

(2) In column 1 —

(a) List the unit and type of ammunition from — TOE; weapons and missiles.

(b) Add nonweapon items as provided for in table 5-25.

(3) In column 4, list number of weapons authorized by the TOE.¹

¹ If the unit is a separate brigade or larger, the number of major items authorized may be obtained from chapter 1 tables. For all other major items and all secondary items, the TOE should be used.

(4) Identify the unit by category from section I of its TOE.

(5) In column 2, list "round per weapon" from table 5-25. Distinguish allowance per unit category, if applicable.

(6) In columns 3, 6, 8, and 10 list remaining data from table 5-25.

(7) Multiply weights (col 7, 9, and 11) and add for each line of column 12.

(8) Add column 12; divide by 2,000 to obtain STON.

b. Tables 5-26 and 5-27 are sample basic loads for the infantry battalion, separate light infantry brigade (TOE 7-175G) and the field artillery battalion, 175-mm self-propelled (TOE 6-435G) respectively.

Table 5-25. Ammunition Basic Load Guide

1	2	3	4	5	6	7	8	9
Line item number	Weapon/equipment	Unit category	Rd per wpn	Packed wt per rd (lb)	Rd per wpn carried on indiv	Rd per wpn carried on veh	Rd per wpn bulk loaded	Remarks
2	A89819 Armt pod, acft, 7.62-mm mg, with equip, XM18		6,000	0.093		1,500	4,500	
3	A90117 Armt subsys, hel, 7.62-mm mg, lt, M23		4,200	0.093		1,200	3,000	
4	A90122 Armt subsys, hel, 7.62-mm mg, M24		4,200	0.093		1,200	3,000	
5	A90154 Armt subsys, hel, 7.62-mm mg, XM27		4,500	0.093		1,500	3,000	
6	A90186 Armt subsys, hel, 7.62-mm mg, twin, M2		6,500	0.093		1,300	5,200	
7	A90323 Armt subsys, hel, 7.62-mm mg, quad, M6		18,000	0.093		6,000	12,000	
8	A90343 Armt subsys, hel, 7.62-mm mg, XM41		4,200	0.093		1,200	3,000	
	A90391 Armt subsys, hel, 7.62-mm mg/2.75-in RL, M16:							
9	A90323 Mg, 7.62-mm		14,700	0.093		6,000	8,700	
10	L45016 Lchr, rkt, 2.75-in		42	27.000		14	28	
	A90426 Armt subsys, hel, 7.62-mm mg/2.75-in RL, M21:							
11	A90186 Mg, 7.62-mm		21,000	0.093		6,000	15,000	
12	A90391 Lchr, rkt, 2.75-in		42	27.000		14	28	
	A90436 Armt subsys, hel, 7.62-mm mg/40-mm GL, XM28:							
13	A90186 Mg, 7.62-mm		2,250	0.093		750	1,500	
14	A90460 Lchr, gren, 40-mm		321	0.750		107	214	
15	A90460 Armt subsys, hel, 40-mm GL, M5		321	0.750		107	214	
16	Armt subsys, hel, 40-mm GL, XM8		450	0.750		150	300	
17	A90597 Armt subsys, hel, 2.75-in RL, XM3		144	27.000		48	96	
18	Armt subsys, hel, 2.75-in RL, XM4		144	27.000		48	96	
19	A90871 Armt subsys, hel, GM lchr, M22			112.000				See note 1.
20	Armt subsys, hel, 7.62-mm mg, XM7		5,250	0.093		1,500	3,750	
	A93124 ARAAV, M551:							
21	Lchr, gren, 40-mm, E21		16	0.750		8	8	
22	Lchr, gun, 152-mm		40	60.000		20	20	
23	Mg, cal .50		1,000	0.395		1,000		
24	Mg, 7.62-mm		3,000	0.093		3,000		
25	Msl, at		20	120.000		10	10	
26	U56346 Smg, cal .45		360	0.056		360		
27	B86589 Bolt, explo		36	3.330		6	30	
28	C39059 Burster, fld, incd		40	2.500			40	Per rifle bn.
	D10725 Carr, 81-mm mort, FTRAC, M125A1:							
29	H71344 Flare, sur, trip		10	1.940		10		
30	Fuze		34	3.840		19	15	See SB 38-26.
31	J77532 Gren, hand, frag		8	2.125		8		
32	L91838 Mg, cal .50		2,100	0.395		525	1,575	
33	Proj		155	17.320		114	41	See SB 38-26.
	D10740 Carr, 107-mm mort, SP, M106:							
34	H71344 Flare, sur, trip		10	1.940		10		
35	Fuze		58	3.840		35	23	See SB 38-26.
36	J77532 Gren, hand, frag		8	2.125		8		
37	L91838 Mg, cal .50		2,205	0.395		2,205		
38	Proj		163	40.000		93	70	See SB 38-26.

Table 5-25—Continued

1	Line item number	Weapon/equipment	Unit category	Rd per wpn	Packed wt per rd (lb)	Rd per wpn carried on indiv	Rd per wpn carried on veh	Rd per wpn bulk loaded	Remarks
39	D11048	Car, cgo, tracked, 6-ton, M548							No armament will carry— 36 8-in rd 36 175-mm rd 80 155-mm rd 200 105-mm rd
	D11401	Carr, comd and recon, armd, M114:							
40	H71344	Flare, sur, trip		12	1.940		12		
41	J77532	Gren, hand, frag		8	2.125		8		
42	L91838	Mg, cal .50		945	0.395		945		
43	L92352	Mg, 7.62-mm		2,970	0.093		2,970		
	D11538	Carr, CP, lt, tracked, M577:							
44	H71344	Flare, sur, trip		12	1.940		12		
45	J77532	Gren, hand, frag		20	2.125		20		
	D12086	Carr, pers, FTRAC, armd, M113:							
46	H71344	Flare, sur, trip		12	1.940		12		
47	J77532	Gren, hand, frag		20	2.125		20		
48	L91838	Mg, cal .50		1,995	0.395		1,995		
49	D93182	Chg, dml, M5A1, block, comp C-4, 2 1/2-lb		40	3.330		40		
50	E56577	CEV, with gun, 165-mm, M728 (T-118)							See SB 38-26.
51	H71344	Flare, sur, trip		10	1.940		10		
52	J77532	Gren, hand, frag		8	2.125		8		
53	L92112	Mg, cal .50		735	0.395		735		
54	L92352	Mg, 7.62-mm		3,410	0.093		3,410		
55		Proj, 165-mm (XM135 cannon)		60	92.400		30	30	
	F91490	Dml set, explo, initiating, elec and semielec:							
56	D00599	Cap, blasting, sp, elec, M130		50	0.005			50	
57	D00873	Cap, blasting, sp, nonelec, M131		50	0.005			50	
58	D93182	Chg, dml, M5A1, block, comp C-4, 2 1/2-lb, M038		40	3.330			40	
59	D93730	Chg, dml, block, TNT, 1-lb, M032		50	1.450			50	
60	F14986	Cord, detonating, PETN, M455		500 ft	0.0184 ft			9	
61	G01293	Destructor, explo, M241		5	1.560			5	
62	J07059	Fuze, blasting, time, M670		100 ft	0.0235 ft			2	
63	K67317	Igniter, time, blasting fuze, M766		50	0.188			50	
		Dml set, explo, initiating, elec and nonelec:							
64	D00599	Cap, blasting, sp, elec, M130		50	0.005			50	
65	D00673	Cap, blasting, sp, nonelec, M131		50	0.005			50	
66	D93182	Chg, dml, M5A1, block, comp C-4, 2 1/2-lb, M038		40	3.330			40	
67	D93730	Chg, dml, block, TNT, 1-lb, M032		50	1.450			50	
68	F14986	Cord, detonating, PETN, M455		500 ft	0.0184 ft			9	
69	G01293	Destructor, explo, M241		5	1.560			5	
70	J07059	Fuze, blasting, time, M670		100 ft	0.0235 ft			2	
71	K67317	Igniter, time, blasting fuze, M766		50	0.188			50	
	F91627	Dml set, explo, initiating, nonelec:							
72	D00873	Cap, blasting, sp, nonelec, M131		50	0.005			50	

Table 5-25—Continued

1	Line item number	Weapon/equipment	Unit category	Rd per wpn	Packed wt per rd (lb)	Rd per wpn carried on indiv	Rd per wpn carried on veh	Rd per wpn bulk loaded	Remarks
73	D93182	Chg, dml, M5A1, block, comp C-4, 2½-lb, M038		40	3.330			40	
74	F14986	Cord, detonating, PETN, M455		200 ft	0.0184 ft			4	
75	G01293	Destructor, explo, M241		2	1.560			2	
76	J07059	Fuze, blasting, time, M670		100 ft	0.0235 ft			2	
77	K67317	Igniter, time, blasting fuze, M766		50	0.188			50	
	G22109	Disperser, riot con agt; hel- or veh-mtd:							
78		Riot con agt, CS1		240 lb	1.080			240 lb	
	G22246	Disperser, riot con agt, ptbl:							
79		Riot con agt, CS1		64 lb	1.080			64 lb	
	H68083	Flamethrower, ptbl:							
80	K67817	Ignition cyl, flamethrower		8	0.280			8	
81		Peptizer (1-gal can)		1	8.000			1	
82	W12352	Thickener, incd oil (5¼-lb can)		2	5.000			2	See note 2.
83		Flare, gun, FG1			0.437		(b)		
84		Flare, sur, trip, NP3, M2			1.940			(a)	
		Genr, smoke, mech:							
85		Fog oil, SGF2 (55-gal drum)		3	461.000			3	
86		Gas (5-gal can)		2	4.000			2	
87	J77532	Gren, hand, frag, comp B, M26A2	I and II		2.125	(c)			
88	J77532	Gren, hand, frag, comp B, M26A2	III		2.125	(d)			
89	J77763	Gren, hand, incd, TH3		4	2.940			4	Per track-laying veh and watercraft. See note 3.
90	J79407	Gren, hand, riot, CN		48	2.060			48	Per MP co. See note 3.
91	J79544	Gren, hand, riot, CS		160	1.875			160	Per MP co. See note 3.
92	J79681	Gren, hand, smoke, HC		48	2.560			48	Per cat I co. See note 3.
93	J79818	Gren, hand, smoke, colored		16	1.360			16	See note 3.
94		Gren, hand, riot, CS1		350	1.000			350	Per rifle plat and MP plat
95		Gren, hand, riot, DM1		200	1.000			200	Per MP co. See note 3.
96	J80092	Gren, hand and rifle, smoke, WP		16	2,625			16	Per rifle plat and recon co.
97		GM, Entac		15	112.000		15		15 rd per launching sta.
98		GM, PERSH			19,501.000		(e)		
		GM sys, intep, aerial, carr-mtd (Chap):							
99	H71344	Flare, sur, trip		12	1.940		12		
100	J77532	Gren, hand, frag		20	2.125		20		
101		Msl		16	187.000		12	4	Computed per firing unit.
102		GM sys, intep, aerial, M41 (Redeye)			29.300	3	3		6 rd per each 2 gunners.
	J96694	Gun, antiaircraft arty, SP, 20-mm, XM163 (Vulc):							
103	D39124	Ctg, 20-mm		6,000	1.000		1,800	4,200	
104	H71344	Flare, sur, trip		12	1.940		12		
105	J77532	Gren, hand, frag		20	2.125		20		
106	J96845	Gun, antiaircraft arty, towed, 20-mm, XM167 (Vulc)		4,000	1.000		300	3,700	
	J97230	Gun, FA, SP, 175-mm, M107:							
107	D97155	Chg, propelling, 175-mm		120	114.000		2	118	See SB 38-26.

See footnotes at end of table.

Table 5-25—Continued

1	Line item number	2 Weapon/equipment	3 Unit category	4 Rd per wpn	5 Packed wt per rd (lb)	6 Rd per wpn carried on indiv	7 Rd per wpn carried on veh	8 Rd per wpn bulk loaded	9 Remarks
108	H71344	Flare, sur, trip		10	1.940		10		
109		Fuze		145	3.313		2	143	See SB 38-26.
110	J77532	Gren, hand, frag		8	2.125		8		
111	P74433	Proj, 175-mm, M403		114	158.000		2	112	See SB 38-26.
	K56981	How, hv, SP, 8-in, M110:							See SB 38-26.
112		Chg		158	47.940		2	156	
113	H71344	Flare, sur, trip		10	1.940		10		
114		Fuze		159	3.490		3	156	
115	J77532	Gren, hand, frag		8	2.125		8		
116		Primer		158	0.092		2	156	
117		Proj		150	211.000		2	148	
	K57118	How, hv, towed, 8-in, M115:							
118		Chg		105	47.940		20	85	
119		Fuze		105	3.490		20	85	
120		Primer		105	0.092		20	85	
121		Proj		100	211.000		20	80	
	K57255	How, lt, SP, 105-mm, M108:							See SB 38-26.
122		Ctg		250	65.000		56	194	
123	H71344	Flare, sur, trip							
124		Fuze		245	3.470		56	189	
125	J77532	Gren, hand, frag		10	2.125		10		
126	L92112	Mg, cal .50		630	0.395		630		
	K57392	How, lt, towed, 105-mm, M102:							Except abn. See SB 38-26.
127		Ctg		200	65.000		60	140	
128		Fuze		193	3.470		58	135	
	K57529	How, towed, 105-mm, M101:							Abn. See SB 38-26.
129		Ctg		190	65.000		40	150	
130		Fuze		183	3.470		40	143	
	K57666	How, mdm, SP, 155-mm, M109:							See SB 38-26.
131		Chg		289	29.386		32	257	
132	H71344	Flare, sur, trip		10	1.940		10		
133		Fuze		333	3.313		32	301	
134	J77532	Gren, hand, frag		8	2.125		8		
135	L92112	Mg, cal .50		630	0.395		525	105	
136		Primer		289	0.092		32	257	
137		Proj		275	103.040		28	247	
	K57803	How, mdm, towed, 155-mm, M114:							See SB 38-26.
138		Chg		158	29.386		30	128	
139		Fuze		182	3.313		30	152	
140		Primer		158	0.092		30	128	
141		Proj		150	103.040		28	122	
	L43781	Lchr, brg, APC, M113 series:							
142	H71344	Flare, sur, trip		16	1.940		16		
143	J77532	Gren, hand, frag		8	2.125		8		

Table 5-25—Continued

1	2	3	4	5	6	7	8	9
Line item number	Weapon/equipment	Unit category	Rd per wpn	Packed wt per rd (lb)	Rd per wpn carried on indiv	Rd per wpn carried on veh	Rd per wpn bulk loaded	Remarks
144	L44575 Lehr, gren, 40-mm, M79	I	30	0.750	18	6	6	
145	L44575 Lehr, gren, 40-mm, M79	I and III	10	0.750	10			
146	L44629 Lehr, GM, carr-mtd (Hawk), XM754			3,200.000				6 rd per lchr.
147	Lehr, GM (SGT)			12,473.000				2 per firing btry.
148	L44712 Lehr, monorail, GM (HERC), XM36E1			18,100.000				72 msl per bn, 18 msl per btry.
149	L45123 Lehr, rkt, multiple, 115-mm, M91 (T145)			93.330				See note 4.
150	L45260 Lehr, rkt, 3.5-in, M20							See note 5.
151	L45397 Lehr, rkt, 318-mm (LJ)		6	3,068.000		6		24 rd per bn.
152	L45534 Lehr, rkt, 762-mm, trk-mtd		6	6,060.000		6		
153	L90742 Mg, cal .30, lt, flex, M1919A6		3,000	0.086	500	1,500	1,000	
154	L90879 Mg, cal .30, veh, lt, M37		3,000	0.089	500	1,500	1,000	
155	L91975 Mg, cal .50, hv-bbl, flex, for gnd use, M2	I	630	0.395		420	210	
156	L91975 Mg, cal .50, hv-bbl, flex, for gnd use, M2	II and III	525	0.395		525		
157	L92386 Mg, 7.62-mm, lt, flex, M60	I	3,080	0.093	880	1,320	880	Less arty units.
158	L92386 Mg, 7.62-mm, lt, flex, M60	I	1,760	0.093		880	880	Arty units.
159	L92386 Mg, 7.62-mm, lt, flex, M60	II and III	2,200	0.093		2,200		
160	M45945 Mine, apers, M14, nonmetallic			0.490				See note 6.
161	M46082 Mine, apers, M16 series			11.200				See note 7.
162	M46219 Mine, apers, M18			6.800				See note 8.
163	M48137 Mine, at, M21			22.700				See note 9.
164	M67871 Mort, 60-mm, on mount		240			120	120	
165	M68008 Mort, 81-mm, on mount:							
166	Fuze		26	3.840		14	12	See SB 38-26.
166	Proj		120	17.320		80	40	See SB 38-26.
167	M68282 Mort, 4.2-in, on mount:							
168	Fuze, pt-detonating		11	3.250		11		See SB 38-26.
169	Fuze, proximity		45	3.840		23	22	See SB 38-26.
170	Proj		160	40.000		24	136	See SB 38-26.
171	N96741 Pistol, cal .45, auto		21	0.056	21			
171	N97015 Pistol, pyrotechnic, AN-M8		48	0.630		12	36	
172	R50543 Recov veh, FTRAC, lt, armd, M578:							
173	Flare, sur, trip		16	1.940		16		
174	Gren, hand, frag		8	2.125		8		
175	Mg, cal .50		525	0.395		525		
176	R50680 Recov veh, FTRAC, mdm, M88:							
177	Flare, sur, trip		12	1.940		12		
178	Gren, hand, frag		8	2.125		8		
179	Mg, cal .50		1,470	0.395		1,470		
180	R91244 Revolver, cal .38, 4-in bbl		18	0.038	18			
181	R94840 Rifle, cal .22, coml, tng, gr, M13	All	400	0.010		400		
182	R94977 Rifle, 5.56-mm, auto	All	740	0.042	140	360	240	
183	R94977 Rifle, 5.56-mm, semiauto	I	340	0.042	140	200		Less arty units.
184	R94977 Rifle, 5.56-mm, semiauto	II and III	160	0.042	100	60		Incl arty units.
185	R95114 Rifle, 7.62-mm, M14	I	340	0.083	100	120	120	Less arty units.

Table 5-25—Continued

1	Line item number	Weapon/equipment	Unit category	Rd per wpn	Packed wt per rd (lb)	Rd per wpn carried on indiv	Rd per wpn carried on veh	Rd per wpn bulk loaded	Remarks
184	R95114	Rifle, 7.62-mm, M14	II and III	160	0.083	100	60	-----	Incl arty units.
185	R95251	Rifle, 7.62-mm, auto, with bipod, M14A1	All	760	0.083	160	420	180	-----
186	R95799	Rifle, cal .30, snipers	-----	244	0.094	100	44	100	-----
187	R96073	Rifle, cal .30, auto, Browning, M1918A2	-----	1,000	0.085	240	260	500	-----
188	-----	Rifle, cal .50, spotter	-----	220	0.331	-----	110	110	-----
189	R96210	Rifle, rcl, 57-mm	All	12	11.000	-----	6	6	-----
190	R96484	Rifle, rcl, 90-mm, M67	-----	18	27.500	-----	12	6	-----
191	R96758	Rifle, rcl, 106-mm, on mount, M40A1	-----	30	60.000	-----	17	13	-----
192	S04958	Rkt, HE, 66-mm, at, M72	I	-----	7.800	-----	1/3	2/3	6 rd per 3.5-in RL. See note 5.
193	S04958	Rkt, HE, 66-mm, at, M72	II and III	-----	7.800	-----	1/3	2/3	3 rd per 3.5-in RL. See note 5.
194	T39233	Shotgun, 12-gage, riot-type, 20-in bbl	-----	10	0.138	10	-----	-----	-----
195	T84657	Smokepot, fltg-type, SGF2	-----	2	37.000	-----	-----	2	Per cml smoke genr. See note 3.
196	T84687	Smokepot, M1, gnd-type, HC	-----	2	30.000	-----	-----	2	Per cml smoke genr. See note 3.
197	-----	Starter, fire, NP3, M2	-----	2	0.070	-----	-----	2	Per plat or similar size unit.
198	U56346	Smg, cal .45	-----	180	0.056	180	-----	-----	-----
199	V12826	Tk, cbt, FTRAC, 76-mm gun, M41:	-----	-----	-----	-----	-----	-----	-----
200	-----	Ctg, 76-mm	-----	70	42.000	-----	70	-----	-----
201	H71344	Flare, sur, trip	-----	12	1.940	-----	12	-----	-----
202	J77532	Gren, hand, frag	-----	8	2.125	-----	8	-----	-----
203	L91838	Mg, cal .50	-----	2,175	0.395	-----	2,175	-----	-----
204	L92352	Mg, 7.62-mm	-----	5,000	0.093	-----	5,000	-----	-----
205	V12963	Tk, cbt, FTRAC, 90-mm gun, M48:	-----	-----	-----	-----	-----	-----	-----
206	-----	Ctg, 90-mm	-----	62	63.780	-----	62	-----	-----
207	H71344	Flare, sur, trip	-----	12	1.940	-----	12	-----	-----
208	J77532	Gren, hand, frag	-----	8	2.125	-----	8	-----	-----
209	L91838	Mg, cal .50	-----	630	0.395	-----	630	-----	-----
210	L92352	Mg, 7.62-mm	-----	5,940	0.093	-----	5,940	-----	-----
211	V13100	Tk, cbt, FTRAC, 105-mm gun, M60:	-----	-----	-----	-----	-----	-----	-----
212	-----	Ctg, 105-mm	-----	78	68.490	-----	57	21	-----
213	H71344	Flare, sur, trip	-----	12	1.940	-----	12	-----	-----
214	J77532	Gren, hand, frag	-----	8	2.125	-----	8	-----	-----
215	L91838	Mg, cal .50	-----	1,260	0.395	-----	840	420	-----
216	L92352	Mg, 7-62-mm	-----	5,940	0.083	-----	5,940	-----	-----

a 2 per plat (40 men).

b 1 per flying crewmember.

c 1 per indiv.

d 1 per 3 indiv.

e 1 per firing btry.

Table 5-25—Continued

Note 1. Requires explosive bolts (FSN 1375-885-3480) issued on a one-for-one basis. M22 basic load will be computed based on—

Avn bn, TOE 1-75G	Basic load 12	6 rd in hel	6 rd in bulk
Cav sqdn	Basic load 36	6 rd in hel	30 rd in bulk
Avn bn, TOE 1-55G	Basic load 18	6 rd in hel	12 rd in bulk
FA bn, aerial arty, TOE 6-725T	Basic load 18	6 rd in hel	12 rd in bulk

2. See SB 3-39 for basic loads for burster and mechanized flamethrower, armored personnel carrier or tank.

3. See SB 3-39 for different basic loads assigned to other units, to aircraft, or to other equipment.

4. Under the provisions of USCONARC Pam 700-1, October 1968, paragraph 6-7c(1)(a), toxic munitions will not be requisitioned. This weapon is used for delivery of GB and VX munitions (FSN 1340-716-1450 (H520) and 1340-724-3567 (H521) respectively). Data provided are the maximum required. Authorized basic loads, based on mission, will be provided on DA approval. Weights are not included in the total weight of the basic load.

5. Per DA decision, 7 November 1966, the M72 (rkt, 66-mm, LAW) is to be issued in lieu of the 3.5-inch rocket launcher. If a unit is equipped with the 3.5-inch launcher, the rounds authorized will be equal to the authorization for the M72. Weight of the 3.5-inch round is 18.8 pounds.

6. Basis for computation: 1 per 15 individuals in category I units.

7. Basis for computation: 1 per 30 individuals in category I units plus 40 in nondivisional engineer units.

8. Basis for computation: 10 per artillery battalion and nondivisional engineer battalion.

2 per full-tracked vehicles in armored/mechanized units and separate engineer companies.

15 per engineer battalion, infantry, airborne, and armored divisions.

9. Basis for computation: 1 per 10 individuals in category I units of infantry, airborne, and airmobile divisions and artillery battalions.

2 per 5 individuals in category I units of armored/mechanized divisions, armored cavalry regiments, and separate tank and mechanized battalions.

520 per engineer battalion, armored/mechanized divisions.

100 per engineer battalion, infantry, airborne, and airmobile divisions.

40 per nondivisional engineer battalion.

Table 5-26. Basic Load of Ammunition—Example for an Infantry Unit

	1	2	3	4	5	6	7	8	9	10	11	12
1	Unit and type of munition	Rd per wpn	Packed wt per rd (lb)	Total wpn	Total rd	Carried on indiv		Carried on veh		Bulk loaded		Total wt (lb)
						Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	Rd per wpn	Total wt (lb)	
	Inf bn, sep lt inf bde (TOE 7-175G)											
2	Burster, fld, incd		2.500		40					40	100	100
3	Dml set, explo, initiating, elec and semielec			3							768	768
4	Gren, hand and rifle, smoke WP		2.625		144	144	378					378
5	Gren, hand, frag		2.125		812	812	1,726					1,726
6	Gren, hand, incd		2.940		136			136	400			400
7	Gren, hand, smoke, colored		1.360		144			144	196			196
8	Gren, hand, smoke, HC		2.560		240			240	614			614
9	GM sys, intcp, aerial, M41 (Redeye)	6	29.300			3	440	3	440			880
10	Lchr, gren, 40-mm, M79	30	0.750	86	2,580	18	1,161	6	387	6	387	1,935
11	Mg, 7.62-mm	3,080	0.930	20	61,600	880	1,637	1,320	2,455	880	1,637	5,729
12	Mine, apers, M14, nonmetallic		0.490		54					54	26	26
13	Mine, apers, M16 series		11.200		27					27	302	302
14	Mine, at, M21		22.700		81					81	1,839	1,839
15	Mort, 81-mm, on mount			13								
16	Fuze	26	3.840		338			14	699	12	599	1,298
17	Proj	120	17.320		1,560			80	18,013	40	9,006	27,019
18	Pistol, cal .45, auto	21	0.056	233	4,893	21	274					274
19	Rifle, 5.56-mm, auto	740	0.042	579	428,460	140	3,405	360	8,754	240	5,836	17,995
20	Rifle, rcl, 90-mm, M67	18	27.500	18	324			12	5,940	6	2,970	8,910
21	Rifle, rcl, 106-mm, on mount, M40A1	30	60.000	8	240			17	8,160	13	6,240	14,400
22	Rkt, HE, 66-mm, at (LAW), M72	6	7.800	18	108			2	281	4	562	843
23	Smokepot, HC		54.000		18					18	972	972
24	Total wt											86,604
25	STON											43.3

Table 5-27. Basic Load of Ammunition—Example for an Artillery Unit

[illegible]

Section IV. CLASS VII, MAJOR END ITEMS—DIMENSIONS AND WEIGHTS

5-18. General

This section provides dimensional and weight data of equipment contained in the field army units. Distribution of this equipment among the units is tabulated in chapter 1. Tables 5-18 through 5-35 list major end items of class VII by subclasses. As stated in SB 700-20, consideration has been given primarily to figures contained in TB 55-46 and secondarily to SB 700-20 and other sources. It should be noted that this section provides a representative list of TOE equipment, not a complete list.

5-19. Special Notes

a. Dimensions in columns 3, 4, and 5 are the maximum length, width, and height in feet of fully assembled equipment in travel position. For purpose of this manual, these are the operational dimensions. Reduced dimensions for aircraft, tactical vehicles, and ground support equipment are

minimum shipping dimensions; that is, by securing antennae; removing canvas tops, frames and bows; and folding the windshields. For the purpose of this manual, these are the dimensions for air shipment overseas; also, for convenience of reading the tables, operational dimensions are repeated in the reduced dimensions columns when no change is indicated (as for example, when the item is not reducible).

b. Weights of noncombat vehicles are for unloaded vehicles. Weights of combat vehicles are fighting (loaded) weights (but exclusive of ammunition).

c. Measurement tons, (MTON) represent the volume of the reduced-dimension item, i.e., the reduced cubic feet divided by 40.

d. Major end items of supply classification other than class VII are listed under their respective classes.

Table 5-28. Class VII A (Air)—Weights and Cubes

Table 5-25. Class VII A (Alt)—Weights and Cubes											
1	2	3	4	5	6	7	8	9	10	11	
LIN	Item	Operational dimensions			Reduced dimensions			Reduced	STON	Reduced MTON	
		Length	Width	Height	Length	Width	Height				
		(Dimensions—feet)									
2	A30121	Airplane, obsn, O-1E.....	25.00	36.17	7.92	25.00	8.17	7.42	1,514	0.68	37.85
3	A30171	Airplane, obsn, STOL, OV-1A.....	41.13	41.96	12.83	41.13	41.96	12.83	22,144	6.33	553.60
4	A30221	Airplane, obsn, STOL, OV-1B.....	44.04	48.00	12.83	44.04	48.00	12.83	27,130	6.83	678.20
5	A30271	Airplane, obsn, STOL, OV-1C.....	41.13	41.96	12.83	41.13	41.96	12.83	22,144	6.34	553.60
6	A30421	Airplane, obsn, tnr, TO-1E.....	25.00	36.17	7.92	25.00	8.17	7.42	1,514	0.68	37.85
7	A30621	Airplane, util, U-1A.....	42.00	58.25	12.75	42.00	58.25	12.75	31,193	3.10	779.83
8	A30671	Airplane, util, U-6A.....	30.50	48.08	9.58	30.00	9.42	8.75	2,472	1.56	61.80
9	A30721	Airplane, util, U-8D.....	31.83	45.33	11.42	31.83	45.33	11.42	16,476	3.28	411.90
10	A30821	Airplane, util, U-8F.....	33.33	45.92	14.25	33.33	45.92	14.25	21,810	3.47	545.25
11	A30946	Airplane, util, U-21A.....	35.50	45.92	14.25	35.50	45.92	14.25	23,228	2.70	580.70
12	A30971	Airplane, util, STOL, U-10A.....	30.33	39.00	8.83	30.33	39.00	8.83	10,450	1.12	261.25
13	K29660	Hel, atk, AH-1G.....	53.00	44.00	13.50	53.00	44.00	13.50	31,482	2.64	787.05
14	K29728	Hel, atk, AH-56A.....	60.08	50.42	13.75	60.08	50.42	13.75	41,652	5.86	1,041.30
15	K29797	Hel, basic inst tnr, TH-13T.....	43.25	37.17	9.50	43.25	37.17	9.50	15,271	1.03	381.78
16	K30254	Hel, cgo, trans, CH-34C.....	65.83	56.00	15.92	65.83	56.00	15.92	58,679	3.83	1,466.98
17	K30378	Hel, cgo, trans, CH-47A.....	82.58	51.00	18.58	50.92	12.67	18.58	11,985	8.75	299.63
18	K30383	Hel, cgo, trans, CH-47B.....	85.17	52.83	18.67	51.00	12.67	18.75	30,227	9.85	755.67
19		Hel, cgo, trans, CH-47C.....	85.17	52.83	18.67	51.00	12.67	18.75	30,227	10.12	755.67
20	K30515	Hel, cgo, trans, CH-54A.....	88.50	72.00	25.83	88.50	72.00	25.83	164,610	9.53	4,115.25
21	K30645	Hel, obsn, OH-6A.....	30.25	26.33	8.33	23.33	8.58	8.33	1,669	0.58	41.73
22	K30719	Hel, obsn, OH-13H.....	41.42	8.58	11.75	31.50	8.58	9.33	2,524	0.78	63.10
23	K30746	Hel, obsn, OH-13S.....	43.25	37.17	9.50	43.25	37.17	9.50	15,271	0.99	381.78
24	K30917	Hel, obsn, OH-23D.....	40.58	10.00	12.33	30.50	7.83	10.17	2,429	0.87	60.73
25	K30961	Hel, obsn, OH-23G.....	40.58	10.00	12.33	30.50	7.83	10.17	2,429	0.87	60.73
26	K31749	Hel, util, UH-1B.....	53.67	9.75	16.42	40.00	8.42	10.25	3,451	2.10	86.28
27	K31786	Hel, util UH-1D.....	58.17	9.42	16.67	42.75	8.58	10.92	4,006	2.14	100.15
28	K31795	Hel, util, UH-1H.....	58.08	9.42	10.00	42.75	8.58	10.92	3,970	2.14	99.25

Table 5-29. Class VII B (Ground Support Materiel)—Weights and Cubes

1			2			3			4			5			6			7			8			9			10			11		
1	LIN	Item	Operational dimensions			Reduced dimensions			Reduced cu ft	STON	Reduced MTON																					
			Length	Width	Height	Length	Width	Height																								
												(Dimensions—feet)																				
2	A92919	Armd cab, M2 trac.....	6.00	5.00	1.50	6.00	5.00	1.50	45	1.62	1.13																					
3	B22217	Balk deck, tapered, 6 ft 8 ⁷ / ₁₆ in lg.....	6.75	0.75	1.08	6.75	0.75	1.08	5	0.05	0.13																					
4	C04516	Boom, ext, mid, crane, 5-ft, 10-ton, crawler-mtd, 20-ton, trk-mtd.....	5.00	2.75	2.50	5.00	2.75	2.50	34	0.19	0.85																					
5	C29490	Bucket, clamshell, ¾-cu yd.....	6.00	3.17	6.42	6.00	3.17	6.42	122	1.80	3.05																					
6	E68694	Compressor, recip, pwr-driven, air rcvr, ac, 208—416-v, 60-cy, 3-ph, 15-cfm, 175-psi.....	3.92	2.17	5.83	3.92	2.17	5.83	50	0.32	1.25																					
7	E68968	Compressor, recip, pwr-driven, air rcvr, ac, 208—416-v, 60-cy, 3-ph, 25-cfm, 175-psi.....	6.25	3.00	4.92	6.25	3.00	4.92	92	0.73	2.30																					
8	E69105	Compressor, recip, pwr-driven, air rcvr, gas-driven, 5-cfm, 175-psi.....	5.75	2.33	4.50	5.75	2.33	4.50	60	0.36	1.50																					
9	E69242	Compressor, recip, pwr-driven, air rcvr, gas-driven, 15-cfm, 175-psi.....	6.08	1.83	4.42	5.67	1.83	4.42	46	0.34	1.15																					
10	E70064	Compressor, recip, pwr-driven, trk, 2-whl, pneu tires, gas-driven, 5-cfm, 175-psi.....	5.50	2.08	3.17	5.50	2.08	3.17	36	0.15	0.90																					
11	E70475	Compressor, recip, pwr-driven, air, tlr, gas-driven, 55-cfm, 80-psi.....	6.67	4.00	4.50	6.67	4.00	4.50	120	0.52	3.00																					
12	E70749	Compressor, recip, pwr-driven, air, whl, ac, 208—416-v, 60-cy, 3-ph, 15-cfm, 3,500-psi.....	11.83	5.67	4.42	7.75	5.67	4.42	194	1.03	4.85																					
13	E70817	Compressor, recip, pwr-driven, air, whl, gas-driven, 4-cfm, 3,000-psi.....	4.92	2.00	5.00	4.92	2.00	5.00	49	0.25	1.23																					
14	E70886	Compressor, recip, pwr-driven, air, whl, gas-driven, 15-cfm, 3,500-psi, winterized.....	12.00	5.75	3.50	7.83	5.75	3.50	158	1.10	3.95																					
15	E72393	Compressor, rot, pwr-driven, air, skid, gas-driven, 125-cfm, 100-psi.....	7.25	3.25	4.00	7.25	3.25	4.00	94	1.12	2.35																					
16	E73352	Compressor, rot, pwr-driven, air, whl-mtd, diesel-driven, 600-cfm, 100-psi.....	18.83	6.67	8.00	14.00	6.33	7.08	628	5.08	15.70																					
17	F38693	Crane, trac, towed, 20-ton, 20-ft lift.....	27.33	9.50	9.92	27.33	9.17	9.92	2,485	4.20	62.13																					
18	F40474	Crane-shovel, bsc unit, crawler-mtd, 40-ton, 2-cu yd.....	19.83	11.25	13.75	18.42	11.25	12.67	2,624	40.66	65.60																					
19	F43077	Crane, whl-mtd, 7-ton, with boom crane, 24-ft, with block and tackle, 9-ft.....	17.00	8.50	10.67	17.00	8.50	7.42	1,072	7.74	26.80																					
20	G27664	Distr, bituminous mat, tk-type, gas-driven, trk-mtd, 800-gal.....	27.17	8.08	8.58	27.17	8.08	8.58	1,885	12.38	47.13																					
21	G29945	Ditching mach, diesel-driven, whl-mtd ladder.....	27.25	8.00	12.42	29.58	8.00	10.50	2,485	18.05	62.13																					
22	H32047	Fairlead atch, crane-shovel, crawler-mtd, 40-ton.....	5.92	3.75	3.08	5.92	3.75	3.08	68	1.02	1.70																					
23	H32869	Fairlead roller and sheave, 12 ½-ton crane-shovel, crawler, 20-ton crane-shovel, trk.....	3.00	2.17	1.75	3.00	2.17	1.75	11	0.37	0.28																					
24	H51240	Fil unit, water purification, knapsack, self-priming, diaphragm pump, ¼-gpm.....	1.75	1.50	1.08	1.75	1.50	1.08	3	0.02	0.08																					
25	H56391	Fftg equip set, trk-mtd, AACFT crash, os, cl 530B.....	22.67	7.92	8.83	22.67	7.92	8.33	1,495	7.96	37.38																					
26	H56528	Fftg equip set, trk-mtd, lbrush, os, cl 530B.....	23.58	7.83	9.00	23.58	7.83	7.08	1,309	9.22	32.73																					
27	H56802	Fftg equip set, trk-mtd, struc-type, os, cl 530B.....	23.58	7.83	9.00	23.58	7.83	7.17	1,324	9.41	33.10																					
28	J35561	Genr set, diesel-eng, tlr-mtd, 45-kw, 60-cy, 3-ph, ac, 120/208—240/416-v, PU-407/M.....	14.25	8.00	7.25	14.25	8.00	7.25	827	3.67	20.68																					
29	J35698	Genr set, diesel-eng, trk-mtd, 45-kw, 60-cy, 3-ph, ac, 120/208—240/416-v, PU-408/M.....	26.08	8.08	11.42	26.08	8.08	11.42	2,407	13.22	60.18																					
30	J35835	Genr set, diesel-eng, 15-kw, 60-cy, 3-ph, ac, 120/208—240/416-v, skid.....	7.00	2.67	4.58	7.00	2.67	4.58	86	1.57	2.15																					
31	J36109	Genr set, diesel-eng, 30-kw, 60-cy, 3-ph, ac, 120/208—240/416-v, 50-cy, skid.....	9.00	2.92	6.17	9.00	2.92	5.83	153	2.47	3.83																					
32	J36931	Genr set, diesel-eng, 45-kw, 60-cy, 3-ph, ac, 120/208—240/416-v 50-cy, precise-pwr.....	7.25	3.00	5.00	7.25	3.00	5.00	109	2.47	2.73																					
33	J38712	Genr set, diesel-eng, 100-kw, 60-cy, 3-ph, ac, 120/208—240/416-v, 50-cy, skid.....	9.67	4.00	6.33	9.67	4.00	6.33	245	3.30	6.13																					

Table 5-29—Continued

1	1	2	3			4			5			6			7			8			9			10			11		
	LIN	Item	Operational dimensions			Reduced dimensions			Reduced cu ft	STON	Reduced MTON																		
			Length	Width	Height	Length	Width	Height																					
												(Dimensions—feet)																	
34	J40904	Genr set, gas-eng, tlr-mtd, PU-248/U	13.83	7.00	8.33	13.83	7.00	6.67	646	1.89	16.15																		
35	J41109	Genr set, gas-eng, tlr-mtd, PU-269	13.75	6.92	8.17	13.75	6.92	8.17	777	2.52	19.43																		
36	J41178	Genr set, gas-eng, tlr-mtd, PU-290/MR	13.75	6.92	8.25	13.75	6.92	6.25	594	2.25	14.85																		
37	J41315	Genr set, gas-eng, tlr-mtd, PU-294/G	13.75	6.92	8.25	13.75	6.92	6.00	571	2.35	14.28																		
38	J41589	Genr set, gas-eng, tlr-mtd, PU-322/G	12.25	6.17	6.92	12.25	6.17	4.17	315	1.18	7.88																		
39	J42274	Genr set, gas-eng, 0.15-kw, 60-cy, 1-ph, ac, 120-v, skid	1.50	1.17	1.58	1.50	1.17	1.58	3	1.28	0.08																		
40	J42548	Genr set, gas-eng, 0.3-kw, 60-cy, 1-ph, ac, 120/240-v, shock-mtd, PE-214BCD	1.83	1.25	1.25	1.83	1.25	1.25	3	0.05	0.08																		
41	J42685	Genr set, gas-eng, 0.3-kw, ac, 115-v, 1-ph, 400-cy, dc, 24- to 35-v	1.67	1.33	2.25	1.67	1.33	2.25	5	0.03	0.13																		
42	J43096	Genr set, gas-eng, 0.5-kw, 400-cy, 1- and 3-ph, ac, 120-120/240-120/208-v	2.50	2.08	2.42	2.50	2.08	2.42	13	0.10	0.33																		
43	J43233	Genr set, gas-eng, 0.5-kw, 2-wire, dc, 28-v, shock	2.92	2.17	2.25	2.92	2.17	2.25	14	0.10	0.35																		
44	J43918	Genr set, gas-eng, 1.5-kw, 60-cy, 1-ph, 2-wire, ac, 120-v, shock	3.08	2.00	2.08	3.08	2.00	2.08	13	0.17	0.33																		
45	J44055	Genr set, gas-eng, 1.5-kw, dc, 28-v, shock	2.33	1.83	1.75	2.33	1.83	1.75	7	0.09	0.18																		
46	J44329	Genr set, gas-eng, 2-kw, dc, 12-v, shock	4.00	3.42	2.92	4.00	3.42	2.92	40	0.37	1.00																		
47	J45699	Genr set, gas-eng, 3-kw, 60-cy, 1-3-ph, 120/240-120/208-v, skid-shock	3.50	2.33	2.75	3.50	2.33	2.75	22	0.18	0.55																		
48	J47068	Genr set, gas-eng, 5-kw, 60-cy, 1-3-ph, ac, 120/240-120/208-v, skid-shock-mtd	8.50	6.33	4.17	8.50	6.33	4.17	224	0.74	5.60																		
49	J48439	Genr set, gas-eng, 5-kw, ac, 120/208-v, 3-ph, 400-cy, skid-shock-mtd	3.67	3.17	2.67	3.67	3.17	2.67	31	0.35	0.78																		
50	J48987	Genr set, gas-eng, 5-kw, dc, 120-v, skid	5.17	2.50	3.50	5.17	2.50	3.50	45	0.34	1.13																		
51	J49055	Genr set, gas-eng, 7.5-kw, dc, 28.5-v, whl-mtd	6.08	2.50	2.83	6.08	2.50	2.83	43	0.28	1.08																		
52	J49261	Genr set, gas-eng, 10-kw, 400-cy, 1-3-ph, ac, 120-120/208-v, skid	8.58	5.83	3.67	8.58	5.83	3.67	184	1.45	4.60																		
53	J49466	Genr set, gas-eng, 10-kw, 400-cy, 1-3-ph, ac, 120-120/240-120/208-v, skid	4.75	2.75	2.58	4.75	2.75	2.58	34	0.37	0.85																		
54	J50220	Genr set, gas-eng, 10-kw, ac, 120/208-v, 3-ph, 400-cy, side-rail, precise-pwr	5.50	3.50	3.75	5.50	3.50	3.75	72	0.50	1.80																		
55	J74715	Grader, rd, mtz, diesel-driven, air-trans, 6x4	22.67	7.25	9.08	22.67	7.25	6.58	1,082	8.15	27.05																		
56	J74852	Grader, rd, mtz, diesel-driven, hv, 6x4, front-whl steering	26.75	8.00	8.58	26.75	8.00	7.42	1,587	13.18	39.68																		
57	K53816	Hose, cotton, rubber-lined, male-female expandable coupling, 2 1/2-in inside diam, 50 ft lg, sgl	1.75	1.75	0.33	1.75	1.75	0.33	1	0.02	0.03																		
58	K53885	Hose, cotton, rubber-lined, male-female expandable coupling, 4.5-in 4 Natl Hose, 3.5-in inside diam, 16 ft lg	2.50	1.50	0.58	2.50	1.50	0.58	2	0.02	0.05																		
59	K54022	Hose, linen, unlined, male-female expandable coupling, 1 1/2-in., 50 ft lg	1.17	1.17	0.25	1.17	1.17	0.25	1	0.01	0.03																		
60	L16026	Jetting set, ptbl, piledriver-op (Army)	22.00	2.75	1.25	22.00	2.75	1.25	76	0.74	1.90																		
61	L27293	Kit, ftg, airmbl	2.42	0.75	0.67	2.42	0.75	0.67	1	0.01	0.03																		
62	L43781	Lchr, brg, APC, M113 ser, mtd	17.42	10.25	9.08	17.42	10.25	9.08	1,622	11.50	40.55																		
63	L49089	Lead sec, top piledriver, 15 ft lg	15.00	3.17	2.33	15.00	3.17	2.33	111	0.42	2.78																		
64	L76351	Loader, scoop-type, diesel-driven, 4-whl, 1 1/2-cu yd	18.08	7.08	8.42	18.08	7.08	6.75	865	7.30	21.63																		
65	M54151	Mixer, concrete, tlr-mtd, gas-driven, 16-cu ft	13.00	7.75	10.75	8.67	7.75	10.75	722	3.02	18.05																		
66	P90591	Pump, cntrf, gas-driven, base-mtd, 1 1/2-in, 30-40-gpm	1.58	1.42	0.92	1.58	1.42	0.92	2	0.02	0.05																		
67	P90610	Pump, cntrf, gas-driven, base-mtd, 1 1/2-in, 100-gpm	3.00	3.00	2.42	3.00	3.00	2.42	22	0.13	0.55																		
68	P92030	Pump, cntrf, gas-driven, frame-mtd, 2-in, 125-gpm, 50-ft head	2.17	1.75	2.75	2.17	1.75	2.75	10	0.11	0.25																		
69	P94907	Pump, recip, dir act, 1 1/4-in suction, 1-in disch, 250-psi	2.58	1.25	1.17	2.58	1.25	1.17	4	0.09	0.10																		
70	P96640	Pumping assy, flammable, liq, bulk trf	2.75	2.00	4.08	2.75	2.00	4.08	22	0.22	0.55																		
71	S11068	Roller, mtz, gas-driven, tandem, 2 rolls, 5- to 8-ton	14.83	5.33	7.17	14.83	5.33	5.42	429	6.50	10.73																		

Table 5-29—Continued

	1	2	3	4	5	6	7	8	9	10	11
1	LIN	Item	Operational dimensions			Reduced dimensions			Reduced cu ft	STON	Reduced MTON
			Length	Width	Height	Length	Width	Height			
			(Dimensions—feet)								
72	S11205	Roller, mtz, gas-driven, tandem, 3 rolls, 9- to 14-ton.....	20.67	5.58	7.67	20.67	5.58	5.92	683	10.75	17.08
73	S11684	Roller, mtz, pneu-tired, airmbl, 9-whl.....	12.50	5.75	7.08	12.50	5.75	7.08	509	3.34	12.73
74	S12164	Roller, towed, pneu-tired, 13-tire, 9-ton.....	14.83	7.42	4.17	14.83	7.42	4.17	458	1.70	11.45
75	S12433	Roller, towed, pneu-tired, 4-tire, 7 ½-ton ballast to 50-ton.....	24.58	8.00	7.67	24.58	8.00	7.67	1,508	7.36	37.70
76	S12575	Roller, towed, sheepsfoot, 2-drum.....	12.67	9.83	4.50	12.67	9.83	4.50	561	3.75	14.03
77	V09593	Tagline, crane and crane-shovel, ¾- to ½-cu yd bucket.....	3.17	1.92	1.25	3.17	1.92	1.25	8	0.13	0.20
78	V11141	Tamper, piston-hammer-type, pneu.....	2.17	0.50	0.50	2.17	0.50	0.50	1	0.02	0.03
79	W76816	Trac, FTRAC, low-spd, diesel, mdm DBP, with bulldozer, with scarifier winch.....	19.08	11.25	10.17	19.08	11.25	7.50	1,610	26.47	40.25
80	X48914	Trk, lift, fork, diesel-driven, 6,000-lb cap.....	22.42	8.50	10.25	15.75	8.50	9.00	1,205	11.48	30.13
81	X51654	Trk, lift, fork, gas, 4,000-lb, 180-in lift ht.....	10.33	3.25	7.50	6.83	3.25	7.50	167	3.55	4.18
82	X51791	Trk, lift, fork, gas, pneu-tired, 6,000-lb.....	12.92	6.08	9.58	9.58	6.08	9.58	559	5.14	13.98
83	X52476	Trk, lift, fork, gas, pneu-tired, 10,000-lb, rough.....	24.08	8.75	10.92	19.42	8.75	8.42	1,430	15.27	35.75
84	Y35212	Water purification equip, tlr-mtd, diatomite fil, 600-gph.....	14.67	8.17	6.83	14.67	8.17	6.75	809	2.78	20.23
85	Y35486	Water purification set, trk-mtd, diatomite fil, 1,000-gph (Army).....	23.42	8.33	10.67	23.42	8.33	10.58	2,065	9.47	51.63

Table 5-30. Class VII G—Electronics—Weights and Cubes

	1	2	3	4	5	6	7	8	9	10	11
1	Line item number	Item	Operational dimensions			Reduced dimensions			Reduced cu ft	STON	Reduced MTON
			Length	Width	Height	Length	Width	Height			
			(Dimensions—feet)								
2	D12634	Carr sys, tel, AN/TCC-7.....	1.75	1.58	1.50	1.75	1.58	1.50	25.2	0.37	0.63
3	D79044	Central ofc, tel, manual, AN/MTC-3, less pwr.....	11.92	6.75	6.75	11.92	6.75	6.75	543.0	2.00	13.58
4	D79318	Central ofc, tel, manual, AN/MTC-9.....	26.58	8.00	11.58	26.58	8.00	11.58	4,920.0	18.77	123.00
5	N59897	Pnl patching, comm, SB-675/MSC.....	11.92	6.75	6.75	11.92	6.75	6.75	543.0	1.32	13.58
6	Q23806	Rdo rpt set, AN/MRC-103.....	11.50	6.67	6.50	11.50	6.67	6.50	543.0	2.75	13.58
7	Q30383	Rdo set, AN/GRC-19.....	3.51	1.25	1.08	3.51	1.25	1.08	4.8	0.12	0.12
8	Q32345	Rdo set, AN/GRC-87.....	5.50	1.08	1.00	5.50	1.08	1.00	5.6	0.08	0.14
9	Q32756	Rdo set, AN/GRC-106.....	4.25	2.25	1.50	4.25	2.25	1.50	2.5	0.06	0.06
10	Q33474	Rdo set, AN/GRC-125.....	1.33	1.17	0.58	1.33	1.17	0.58	2.5	0.04	0.06
11	Q34351	Rdo set, AN/GRR-5.....	1.25	0.92	1.33	1.25	0.92	1.33	1.5	0.03	0.04
12	Q40448	Rdo set, AN/TRC-24, less pwr.....	3.67	2.83	2.58	3.67	2.83	2.58	84.0	1.08	2.10
13	Q45779	Rdo set, AN/VRC-12.....	3.58	1.17	0.58	3.58	1.17	0.58	3.6	0.08	0.09
14	Q50421	Rdo set, AN/VRC-24.....	2.08	1.75	1.25	2.08	1.75	1.25	4.6	0.07	0.12
15	Q53001	Rdo set, AN/VRC-46.....	1.33	1.17	0.08	1.33	1.17	0.08	1.9	0.06	0.05
16	Q55510	Rdo set, AN/VRC-53.....	1.33	1.17	0.08	1.33	1.17	0.08	1.8	0.03	0.05
17	Q91570	Rdo tml set, AN/MRC-68, less pwr.....	6.33	4.83	5.08	6.33	4.83	5.08	156.0	1.89	3.90
18	Q91844	Rdo tml set, AN/MRC-69, less pwr.....	11.92	6.75	6.75	11.92	6.75	6.75	543.0	3.75	13.58
19	Q92173	Rdo tml set, AN/MRC-102.....	11.50	6.67	6.50	11.50	6.67	6.50	543.0	1.80	13.58
20	Q92529	Rdo tml set, AN/TRC-80.....	8.33	6.67	5.75	8.33	6.67	5.75	320.0	2.40	8.00
21	R38590	Rec set, rdo, AN/MRR-8, less pwr.....	11.92	6.75	6.75	11.92	6.75	6.75	543.0	2.33	13.58
22	R77394	Rpt set, rdo, AN/MRC-54V, less pwr.....	11.92	6.75	6.75	11.92	6.75	6.75	543.0	3.11	13.58
23	U82460	Swbd, tel, manual, SB-1896/TTC.....	1.00	3.00	2.00	1.00	3.00	2.00	6.0	0.05	0.15
24	V57846	Tml, tg/tel, AN/MCC-6, less pwr.....	11.92	6.75	6.75	11.92	6.75	6.75	525.0	2.50	13.13
25	X20444	Xmit set, rdo, AN/MRT-9, less pwr.....	11.92	6.75	6.75	11.92	6.75	6.75	543.0	2.51	13.58

Table 5-31. Class VII K (Tactical Vehicles)—Weights and Cubes

1			2			3			4			5			6			7			8			9			10			11		
1	LIN	Item	Operational dimensions			Reduced dimensions			Reduced cu ft	STON	Reduced MTON																					
			Length	Width	Height	Length	Width	Height																								
												(Dimensions—feet)																				
2	D10725	Carr, 81-mm mort, FTRAC (less mort).....	16.00	8.83	8.00	16.00	8.83	8.00	1,131	9.75	28.28																					
3	D10740	Carr, 107-mm mort, SP (less mort).....	18.42	10.75	9.08	18.42	10.75	9.08	1,798	20.56	44.95																					
4	D10990	Carr, cgo, amph, tracked.....	15.67	6.83	6.58	15.08	6.67	5.25	528	3.94	13.20																					
5	D11538	Carr, CP, lt, tracked.....	15.75	8.83	8.67	15.75	8.33	8.67	1,138	11.00	28.45																					
6	D12086	Carr, pers, FTRAC, armd.....	16.00	8.83	7.25	16.00	8.33	7.25	967	9.88	24.18																					
7	E02670	Chassis, tlr, GP, 3 1/2-ton, 2-whl, with equip.....	15.67	8.08	3.83	15.67	8.08	3.83	485	1.45	12.13																					
8	E02807	Chassis, tlr, genr, 2 1/2-ton, 2-whl, with equip.....	13.92	7.75	3.42	13.92	7.75	3.42	369	1.21	9.23																					
9	E02944	Chassis, tlr, 2 1/2-ton, trailing arm, 2-whl.....	14.58	8.00	3.75	14.58	8.00	3.75	438	1.37	10.95																					
10	G35089	Dolly, tlr convt, 6-ton, 2-whl, with equip.....	9.42	7.83	4.58	9.42	7.83	4.58	338	1.44	8.45																					
11	G35363	Dolly, tlr convt, 18-ton, 4-whl, with equip.....	12.50	9.58	4.83	11.67	9.58	4.83	540	3.96	13.50																					
12	K90188	Inst rep shop, trk-mtd, 2 1/2-ton, 6x6, with equip.....	22.42	8.25	10.75	22.08	8.17	10.75	1,939	8.43	48.48																					
13	S70106	Stlr, low-bed, wkr, 12-ton, 4-whl, 25-ft, with equip.....	35.08	8.08	10.17	34.83	8.08	6.08	1,713	7.13	42.83																					
14	S70243	Stlr, low-bed, wkr, 12-ton, 4-whl, 40-ft, with equip.....	49.67	8.08	10.08	49.42	8.08	6.08	2,430	8.72	60.75																					
15	S70517	Stlr, low-bed, 25-ton, 4-whl, with equip.....	34.92	9.58	5.58	34.67	9.58	5.58	1,855	8.14	46.38																					
16	S70791	Stlr, low-bed, 60-ton, 8-whl, with equip.....	37.17	12.00	7.42	37.17	12.00	7.42	3,308	16.44	82.70																					
17	S70928	Stlr, maint, wpn, connecting unit, 6-ton, 2-whl, with equip.....	23.92	8.08	11.42	22.92	8.08	11.17	2,069	9.10	51.73																					
18	S71065	Stlr, maint, wpn, elec unit, 6-ton, 2-whl, with equip.....	23.25	8.08	11.42	22.92	8.08	11.17	2,069	7.30	51.73																					
19	S71202	Stlr, maint, wpn, mech unit, 6-ton, 2-whl, with equip.....	23.25	8.08	11.42	22.92	8.08	11.17	2,069	6.40	51.73																					
20	S71613	Stlr, reefer, 7 1/2-ton, with unit.....	23.33	8.08	10.67	23.33	8.08	10.67	2,012	3.55	50.30																					
21	S71887	Stlr, stake, 6-ton, 2-whl, with equip.....	23.00	7.92	8.58	23.00	7.92	8.58	1,563	3.57	39.08																					
22	S72024	Stlr, stake, 12-ton, 4-whl, with equip.....	29.33	8.17	9.00	29.33	8.17	5.00	1,198	6.99	29.95																					
23	S72435	Stlr, tk, 9-ton, 1,800-gal.....	23.75	8.17	10.50	23.75	8.17	10.50	2,037	8.41	50.93																					
24	S72846	Stlr, tk, fuel, 5,000-gal, 12-ton, 4-whl, with equip.....	32.08	8.17	8.83	32.08	8.17	8.83	2,314	7.36	57.85																					
25	S72983	Stlr, tk, fuel svc, 5,000-gal, 12-ton, 4-whl, with equip.....	31.17	8.17	9.08	31.17	8.17	9.08	2,312	6.93	57.80																					
26	S73120	Stlr, tk, water, 2,000-gal, 2-whl, with equip.....	20.67	7.92	7.92	20.67	7.92	7.92	1,295	3.21	32.38																					
27	S73394	Stlr, tk transporter, 50-ton, 8-whl, with equip.....	39.83	12.50	9.58	39.83	7.83	10.42	3,250	22.94	81.25																					
28	S73531	Stlr, van, cgo, 6-ton, 2-whl, with equip.....	22.75	8.08	11.17	22.50	8.08	11.17	2,031	3.71	50.78																					
29	S73668	Stlr, van, 6-ton, 2-whl, with equip.....	22.42	7.92	11.00	22.42	7.92	11.00	1,952	3.48	48.80																					
30	S74079	Stlr, van, cgo, 12-ton, 4-whl, with equip.....	29.42	8.08	11.83	29.17	8.08	11.83	2,790	7.73	69.75																					
31	S74216	Stlr, van, elct, 3-6-ton, 2-whl, 26-ft body, with equip.....	27.33	8.25	11.00	27.08	8.25	11.00	2,458	4.41	61.45																					
32	S74353	Stlr, van, elct, 3-6-ton, 2-whl, 30-ft body, with equip.....	30.83	8.00	7.75	30.83	8.00	7.75	1,912	4.85	47.80																					
33	S74490	Stlr, van, expansible, 6-ton, 4-whl, with equip.....	27.25	8.25	11.25	26.83	8.25	11.25	2,490	8.17	62.25																					
34	S75038	Stlr, van, shop, 6-ton, 2-whl, with equip.....	23.25	8.17	10.92	23.08	8.17	10.92	2,058	3.67	51.45																					
35	S75175	Stlr, van, sup, 12-ton, 4-whl, with equip.....	29.92	8.08	11.83	28.83	8.08	11.83	2,758	7.56	68.95																					
36	W93961	Tlr, acft cgo loading-unloading, 3 1/2-ton, 4-whl, with equip.....	14.58	5.42	2.67	14.58	5.42	2.67	211	1.08	5.28																					
37	W94030	Tlr, ammo, 1 1/2-ton, 2-whl, with equip.....	12.33	7.92	5.33	12.33	7.92	4.83	472	1.38	11.80																					
38	W94441	Tlr, bsc util, 2 1/2-ton, 2 sgl whl, with equip.....	19.42	8.00	3.92	15.42	8.00	3.67	452	1.30	11.30																					
39	W94578	Tlr bolster, pole-hauling, 3 1/2-ton, 2-whl, with equip.....	15.17	6.83	5.67	15.17	6.83	5.67	587	1.27	14.68																					
40	W94715	Tlr bolster, swivel bolster, aja stanchios, 2 1/2-ton, with equip.....	11.83	8.25	7.25	11.83	8.25	7.25	708	1.09	17.70																					
41	W95263	Tlr, cable reel, 3 1/2-ton, 2-whl, with equip.....	13.00	7.33	7.42	12.42	7.33	5.33	486	4.76	12.15																					
42	W95400	Tlr, cgo, 1/4-ton, 2-whl, with equip.....	9.08	5.17	3.67	9.08	5.17	3.67	172	0.29	4.30																					
43	W95537	Tlr, cgo, 3/4-ton, 2-whl, with equip.....	12.25	6.17	6.92	12.25	6.17	4.17	315	0.68	7.88																					
44	W95811	Tlr, cgo, 1 1/2-ton, 2-whl, with equip.....	13.83	6.92	8.17	13.83	6.92	4.58	439	1.34	10.98																					
45	W96907	Tlr, flat-bed, 10-ton, 4-whl, with equip.....	27.83	8.17	4.67	27.83	8.17	4.67	1,061	5.64	26.53																					
46	W97455	Tlr, low-bed, 8-ton, 4 dual whl, with equip.....	23.75	8.67	4.75	19.83	8.67	4.75	816	5.15	20.40																					

Table 5-31—Continued

1			2			3			4			5			6			7			8			9			10			11		
1	LIN	Item	Operational dimensions			Reduced dimensions			Reduced cu ft	STON	Reduced MTON																					
			Length	Width	Height	Length	Width	Height																								
												(Dimensions—feet)																				
47	W97592	Tlr, low-bed, 60-ton, 4 dual front whl, 8 dual rr whl, with equip.....	45.00	10.67	5.42	36.42	10.67	5.42	2,104	14.23	52.60																					
48	W97729	Tlr, maint, tel cable splicer, ¼-ton, 2-whl, with equip.....	9.00	4.75	3.58	9.00	4.75	3.58	153	0.48	3.83																					
49	W98825	Tlr, tk, water, 400-gal, 1½-ton, 2-whl, with equip.....	13.50	6.75	6.67	13.50	6.75	6.67	608	1.42	15.20																					
50	X38639	Trk, amb, ¼-ton, 4x4, with equip.....	12.92	5.08	6.67	166.67	0.08	0.83	12	1.48	0.30																					
51	X38776	Trk, amb, ¾-ton, 4x4, with equip.....	17.08	6.92	7.58	17.08	6.33	16.67	1,803	3.45	45.08																					
52	X39050	Trk bolster, 2½-ton, 6x6, WWN, with equip.....	22.92	7.83	8.25	22.92	7.83	6.67	1,197	6.53	29.93																					
53	X39735	Trk, cgo, ¾-ton, 4x4, with equip.....	15.50	7.00	7.67	15.50	6.25	5.42	525	2.83	13.13																					
54	X39872	Trk, cgo, ¾-ton, 4x4, WWN, with equip.....	15.83	7.00	7.67	15.83	6.25	5.42	536	2.90	13.40																					
55	X40009	Trk, cgo, 2½-ton, 6x6, with equip.....	22.08	8.08	9.58	22.08	8.08	6.75	1,205	6.53	30.13																					
56	X40146	Trk, cgo, 2½-ton, 6x6, WWN, with equip.....	23.25	8.08	9.58	23.25	8.08	6.75	1,269	6.85	31.73																					
57	X40283	Trk, cgo, 2½-ton, 6x6, XLWB, with equip.....	27.42	7.92	10.58	27.42	7.92	6.75	1,465	7.31	36.63																					
58	X40420	Trk, cgo, 2½-ton, 6x6, XLWB, WWN, with equip.....	28.58	7.92	10.58	28.58	7.92	6.75	1,527	7.56	38.18																					
59	X40831	Trk, cgo, 5-ton 6x6, LWB, with equip.....	24.75	8.17	9.83	24.75	8.17	7.17	1,449	10.18	36.23																					
60	X40968	Trk, cgo, 5-ton, 6x6, LWB, WWN, with equip.....	26.08	8.17	9.83	26.08	8.17	7.17	1,527	10.53	38.18																					
61	X41105	Trk, cgo, 5-ton, 6x6, XLWB, with equip.....	31.08	8.17	9.92	31.08	8.17	7.08	1,798	11.67	44.95																					
62	X41242	Trk, cgo, 5-ton, 6x6, XLWB, WWN, with equip.....	32.42	8.17	9.92	32.42	8.17	7.08	1,875	11.93	48.88																					
63	X41790	Trk, cgo, 10-ton, 6x6, WWN, with equip.....	27.92	9.50	11.00	27.92	9.50	7.67	2,033	16.28	50.83																					
64	X43228	Trk, dump, ¾-ton, 4x4, with equip.....	15.83	7.00	7.67	15.83	6.25	5.42	536	3.74	13.40																					
65	X43297	Trk, dump, 2½-ton, 6x6, with equip.....	21.67	7.92	8.67	21.67	7.92	6.75	1,158	7.62	28.95																					
66	X43434	Trk, dump, 2½-ton, 6x6, WWN, with equip.....	20.75	8.00	8.58	20.75	8.00	8.58	1,425	7.79	35.63																					
67	X43708	Trk, dump, 5-ton, 6x6, with equip.....	22.17	8.17	9.33	22.17	8.17	7.17	1,297	11.28	32.43																					
68	X43845	Trk, dump, 5-ton, 6x6, WWN, with equip.....	23.50	8.17	9.33	23.50	8.17	7.17	1,375	11.43	34.38																					
69	X53709	Trk, maint, tel, ¾-ton, 4x4, WWN, with equip.....	17.08	7.08	7.00	17.08	6.42	6.00	658	3.23	16.45																					
70	X53846	Trk, maint, tel const, 2½-ton, 6x6, WWN, with equip.....	22.83	7.92	10.00	22.83	7.92	9.33	1,687	8.15	42.18																					
71	X53983	Trk, maint, earth borer/polesetter, 2½-ton, 6x6, WWN, with equip.....	25.58	7.33	8.17	25.58	7.33	6.83	1,282	8.42	32.05																					
72	X55627	Trk, platform, util, ½-ton, 4x4, with equip.....	9.92	4.17	4.08	8.33	4.17	2.42	84	0.49	2.10																					
73	X56586	Trk, stake, 5-ton, 6x6, WWN, with equip.....	31.08	9.58	9.50	31.08	9.58	7.42	2,209	13.28	55.23																					
74	X57271	Trk, tk, fuel, svc, 2½-ton, 6x6, with equip.....	21.92	8.00	7.42	21.92	8.00	7.42	1,300	6.75	32.50																					
75	X57408	Trk, tk, fuel svc, 2½-ton, 6x6, WWN, with equip.....	23.08	8.00	7.42	23.08	8.00	7.42	1,370	7.52	34.25																					
76	X58367	Trk, tk, water, 1,000-gal, 2½-ton, 6x6, with equip.....	21.92	8.00	7.75	21.92	8.00	7.75	1,359	7.24	33.98																					
77	X59052	Trk, trac, 2½-ton, 6x6, with equip.....	19.00	7.75	8.00	19.00	7.75	8.00	1,178	5.59	29.45																					
78	X59189	Trk, trac, 2½-ton, 6x6, WWN, with equip.....	20.08	7.75	8.00	20.08	7.75	8.00	1,245	5.92	31.13																					
79	X59326	Trk, trac, 5-ton, 6x6, with equip.....	21.50	8.17	8.67	21.50	8.17	7.08	1,244	9.28	31.10																					
80	X59463	Trk, trac, 5-ton, 6x6, WWN, with equip.....	22.75	8.17	8.67	22.75	8.17	7.08	1,316	9.62	32.90																					
81	X59600	Trk, trac, 10-ton, 6x6, with dual midship winch, with high-mtd 5th whl, with equip.....	24.08	9.50	10.00	24.08	9.33	9.33	2,098	14.47	52.45																					
82	X59874	Trk, trac, 10-ton, 6x6, with midship winch, with low-mtd 5th whl, with equip.....	24.08	10.17	9.33	24.08	10.17	7.58	1,857	14.83	46.43																					
83	X60696	Trk, trac, wkr, 5-ton, 6x6, WWN, with equip.....	29.42	8.17	11.00	29.42	8.17	9.50	2,282	16.42	57.05																					
84	X60833	Trk, util, ¼-ton, 4x4, with equip.....	11.00	5.67	6.00	10.92	5.33	4.42	257	1.19	6.43																					
85	X61244	Trk, util, ¼-ton, 4x4, carr for 106-mm rifle, with equip.....	10.92	6.00	5.33	10.92	5.25	4.33	248	1.38	6.20																					
86	X61381	Trk, util, ¼-ton, 4x4, for Davy Crockett, with equip.....	11.33	6.17	5.67	11.25	5.33	4.75	285	1.47	7.13																					
87	X62340	Trk, van, shop, 2½-ton, 6x6, with equip.....	22.42	8.17	10.83	22.08	8.00	10.83	1,914	8.15	47.85																					
88	X62477	Trk, van, shop, 2½-ton, 6x6, WWN, with equip.....	23.25	8.00	10.83	23.25	8.00	10.83	2,015	7.82	50.38																					
89	X63025	Trk, wkr, crane, 2½-ton, 6x6, WWN, with equip.....	25.25	8.00	8.83	25.25	8.00	8.42	1,700	9.89	42.50																					

Table 5-31. Continued

TABLE 317. Continued																						
1	1		2		3		4		5		6		7		8		9		10		11	
	LIN		Item		Operational dimensions			Reduced dimensions			Reduced cu ft		STON		Reduced MTON							
					Length	Width	Height	Length	Width	Height												
																	(Dimensions—feet)					
90	X63094	Trk, wkr, ¾-ton, 4x4, with equip.....	18.00	6.33	7.92	18.00	6.33	7.92	903	3.76	22.58											
91	X63299	Trk, wkr, 5-ton, 6x6, WWN, with equip.....	29.08	8.17	9.50	29.08	8.17	8.92	2,118	17.44	52.95											

Table 5-32. Class VII L (Missiles)—Weights and Cubes

1	2	3	4	5	6	7	8	9	10	11	
1	LIN	Item	Operational dimensions			Reduced dimensions			Reduced cu ft	STON	Reduced MTON
			Length	Width	Height	Length	Width	Height			
2	A02936	Accessory kit, loading rack (HERC).....	4.08	2.00	1.75	4.08	2.00	1.75	14	0.35	0.35
3	A03073	Accessory kit, mbl unit (HERC).....	2.42	1.58	0.67	2.42	1.58	0.67	3	0.11	0.08
4	A80891	Ant-revr-xmtr gp, acq, with equip (HERC).....	15.50	6.33	11.17	15.50	6.33	11.17	1,096	3.53	27.40
5	A81439	Ant-revr-xmtr gp, msl-tracking, tlr-mtd (HERC).....	28.17	8.58	11.92	21.33	8.58	11.92	2,182	6.45	54.55
6	A81576	Ant-revr-xmtr gp, tgt-tracking, tlr-mtd (improved HERC).....	28.17	8.58	11.92	21.33	8.58	11.92	2,182	6.38	54.55
7	A81713	Ant-revr-xmtr gp, tgt-tracking, tlr-mtd (HERC).....	28.17	8.58	11.92	21.33	8.58	11.92	2,182	6.42	54.55
8	A81850	Ant-revr-xmtr gp, tgt-rg, tlr-mtd (improved HERC).....	28.17	8.33	11.25	21.33	8.33	11.25	2,000	6.44	50.00
9	A90871	Armt subsys, hel, GM lchr (M22).....	3.58	3.25	0.58	3.58	3.25	0.58	7	0.33	0.18
10	B07763	ALS, GM (PERSH).....	3.67	4.83	3.00	3.67	4.83	3.00	53	0.19	1.33
11	C61321	Cable assy set, elec (PERSH).....	4.83	4.75	3.00	4.83	4.75	3.00	69	0.85	1.73
12	C68171	Cable set, low-temp (PERSH).....	1.75	0.92	1.25	1.75	0.92	1.25	2	0.02	0.05
13	D13271	Cart, assy trans, 762-mm rkt, with equip (HJ).....	15.50	6.00	3.50	15.50	6.00	3.50	326	0.43	8.15
14	D13956	Cart, rkt trans, 318-mm, with equip (LJ).....	16.17	4.83	2.58	16.17	4.83	2.58	202	0.31	5.05
15	E02533	Chassis, tlr, 2-ton, 2-whl, with equip (Hawk).....	15.67	8.17	3.92	15.67	8.17	3.92	501	1.84	12.53
16	E88120	Con box, GM launching sec, with equip (Hawk).....	2.00	1.58	1.58	2.00	5	1.58	1.58	0.02	0.13
17	E89627	Con indic (HERC).....	5.17	3.67	3.00	5.17	3.67	3.00	57	0.44	1.43
18	E90038	Con indic, with equip (HERC).....	2.17	2.75	2.33	2.17	2.75	2.33	14	0.15	0.35
19	G14047	Dir sta, GM, tlr-mtd, ATBM (improved HERC).....	28.58	8.00	10.67	21.83	8.00	10.67	1,863	7.20	46.58
20	G14184	Dir sta, GM, tlr-mtd (improved HERC).....	28.17	8.00	10.67	21.92	8.00	10.67	1,870	7.21	46.75
21	G14458	Dir sta, GM, tlr-mtd, with equip (HERC).....	28.25	8.08	12.25	21.83	8.08	10.75	1,897	6.99	47.43
22	H01957	Elet shop, tlr-mtd, with equip (HERC).....	26.50	8.00	10.75	20.00	8.00	10.75	1,720	4.89	43.00
23	H14889	Erector-lchr, GM, trans, with equip (PERSH).....	20.25	6.92	7.92	20.25	6.92	7.92	1,109	2.97	27.73
24	J93997	Guidance and launching sta, with equip (Entac).....	4.33	4.00	2.92	4.33	4.00	2.92	51	0.14	1.28
25	J95408	GM btry con central, with equip (Hawk).....	15.67	7.17	6.75	15.67	7.17	6.75	758	2.68	18.95
26	K12718	Hdlg unit, rkt, tlr-mtd, 762-mm, with equip (HJ).....	28.00	8.25	11.00	28.00	8.25	7.00	1,617	0.50	40.43
27	K27486	Heating and tiedown unit, 762-mm rkt, trk-mtd, with equip (HJ).....	32.50	8.25	9.67	32.50	8.17	8.17	2,168	13.28	54.20
28	L44712	Lchr, monorail, GM, with equip (HERC).....	23.67	8.42	3.75	23.67	8.42	3.75	747	0.50	18.68
29	L45397	Lchr, rkt, 318-mm, with equip (LJ).....	18.08	4.17	5.17	18.08	4.17	5.17	389	0.66	9.73
30	L45534	Lchr, rkt, 762-mm, trk-mtd, with equip (HJ).....	32.42	9.50	8.75	32.42	9.50	8.75	2,695	17.29	67.38
31	L45671	Lchr, rkt, 762-mm, with equip (HJ).....	28.83	5.08	6.92	28.83	5.08	6.92	1,014	2.19	25.35
32	L45808	Lchr, zero-lgth, GM, with equip (Hawk).....	14.33	8.00	7.67	9.75	8.00	7.67	598	2.13	14.95
33	L46445	Launching con gp, GM, tlr-mtd, with equip (HERC).....	26.50	8.08	10.75	19.75	8.08	10.75	1,716	4.82	42.90
34	L46729	Launching sta, GM, stlr-mtd, 4-whl (SGT).....	31.92	7.92	7.83	31.92	7.92	7.83	1,979	8.55	49.48
35	L46856	Launching sta, GM, stlr-mtd, 4-whl (SGT).....	31.33	7.83	7.83	31.33	7.83	7.83	1,923	8.35	48.08
36	M62679	Mod kit, GM lchr, transporter kit (HERC).....	10.58	3.92	4.50	10.58	3.92	4.50	187	1.22	4.68
37	Q09982	Rack, loading, GM (HERC).....	10.92	1.33	1.67	10.25	1.33	1.67	23	0.19	0.58

Table 5-32—Continued

1			2			3			4			5			6			7			8			9			10			11		
1	LIN	Item	Operational dimensions			Reduced dimensions			Reduced cu ft	STON	Reduced MTON																					
			Length	Width	Height	Length	Width	Height																								
			(Dimensions—feet)																													
38	Q17606	Rdr set, CW acq, tlr-mtd, with equip (Hawk)-----	14.25	7.83	10.33	16.00	8.17	7.67	1,002	2.25	25.05																					
39	Q17880	Rdr set, high-pwr CW illuminator, tlr-mtd, with equip (Hawk)-----	16.25	8.00	10.83	16.26	8.00	10.83	1,408	4.65	35.20																					
40	Q18017	Rdr set, pulse acq, tlr-mtd, with equip (Hawk)-----	16.00	8.00	10.00	16.00	8.00	7.67	981	3.88	24.53																					
41	Q18154	Rdr set, ROR, tlr-mtd, with equip (Hawk)-----	14.25	7.92	10.00	15.83	7.92	7.67	961	2.80	24.03																					
42	S69969	Stlr, low-bed, 6-ton, 4-whl, with equip (SGT)-----	31.50	7.42	5.00	31.50	7.42	5.00	1,168	2.36	29.20																					
43	T01972	Shield, GM lchr (HERC)-----	8.83	7.67	3.67	8.83	7.67	3.67	248	1.34	6.20																					
44	T43956	Side truss loading rack, GM (HERC)-----	9.33	2.08	2.25	8.00	0.83	1.92	13	0.18	0.33																					
45	T58320	Simulator sta, rdr sig, GM sys (HERC)-----	23.58	8.00	11.00	23.58	8.00	11.00	2,075	9.45	51.88																					
46	W74994	Tracking sta, GM, tlr-mtd, with equip (HERC)-----	28.25	8.00	10.83	21.50	8.00	10.83	1,863	6.64	46.58																					
47	W75131	Tracking sta, GM, tlr-mtd, with equip (improved HERC)-----	28.25	8.00	10.83	21.50	8.00	10.83	1,863	6.92	46.58																					
48	W96496	Tlr, flat-bed, GM, with equip (AJAX)-----	32.00	8.00	4.50	32.00	8.00	4.17	1,067	3.36	26.68																					
49	W97181	Tlr, low-bed, GM, 7-ton (HERC)-----	45.50	8.58	5.25	45.50	8.58	5.25	2,050	7.28	51.25																					
50	W98551	Tlr, rkt transporter, 762-mm, with equip (HJ)-----	25.08	8.00	6.50	25.08	8.00	6.50	1,304	2.50	32.60																					

Table 5-33. Class VII M (Weapons)—Weights and Cubes

1			2			3			4			5			6			7			8			9			10			11		
1	LIN	Item	Operational dimensions			Reduced dimensions			Reduced cu ft	STON	Reduced MTON																					
			Length	Width	Height	Length	Width	Height																								
			(Dimensions—feet)																													
2	A89819	Armt pod acft, 7.62-mm mg, with equip.....	1.92	2.25	8.00	1.92	2.25	8.00	35	0.24	0.88																					
3	A90049	Armt subsys, hel, cal .30 mg, twin.....	6.00	1.75	3.33	6.00	1.75	3.33	35	0.14	0.88																					
4	A90117	Armt sybsys, hel, 7.62-mm mg, lt.....	3.00	3.00	2.33	3.00	3.00	2.33	21	0.10	0.53																					
5	A90122	Armt subsys, hel, 7.62-mm mg, door-mtd, lt wt.....	4.17	2.33	1.83	4.17	2.33	1.83	18	0.09	0.45																					
6	A90154	Armt subsys, hel, 7.62-mm mg, high rate.....	8.00	2.58	3.75	8.00	2.58	3.75	78	0.24	1.95																					
7	A90186	Armt subsys, hel, 7.62-mm mg, twin.....	6.00	2.08	1.83	6.00	2.08	1.83	23	0.14	0.58																					
8	A90343	Armt subsys, hel, 7.62-mm mg, ramp, mtd, lt wt.....	2.83	1.67	1.58	2.83	1.67	1.58	7	0.04	0.18																					
9	A90426	Armt subsys, hel, 7.62-mm mg, 2.75-in RL, high rate.....	6.00	5.25	4.08	6.00	5.25	4.08	129	0.35	3.23																					
10	A93124	Armd recon abn aslt veh.....	20.67	9.17	8.42	20.67	9.17	8.42	1,594	16.25	39.84																					
11	B68766	Bipod rifle, 7.62-mm.....	0.50	0.25	1.08	0.50	0.25	1.08	1	0.01	0.03																					
12	E56577	Cbt engr veh, FRTAC.....	30.58	12.17	16.58	30.58	12.17	16.58	6,171	53.50	154.28																					
13	J96819	Gun, antiaircraft arty, SP, 40-mm.....	20.92	10.58	9.42	20.92	10.58	9.42	2,085	22.15	52.13																					
14	J96956	Gun, at, SP, 90-mm.....	19.17	8.42	6.75	19.17	8.42	6.75	1,089	6.48	27.23																					
15	J97093	Gun, FA, SP, 155-mm.....	27.08	11.67	9.75	27.08	11.67	9.75	3,081	46.50	77.03																					
16	J97230	Gun, FA, SP, 175-mm.....	37.67	10.33	9.08	37.67	10.33	9.08	3,535	28.60	88.38																					
17	J97367	Gun, rcl, 120-mm.....	5.50	2.00	3.42	5.50	2.00	3.42	38	0.21	0.95																					
18	J97504	Gun, rcl, 155-mm.....	8.58	3.17	6.08	8.58	3.17	6.08	165	0.16	4.13																					
19	K56981	How, hv, SP, 8-in.....	22.08	10.33	9.08	22.08	10.33	9.08	2,073	26.50	51.83																					
20	K57118	How, hv, towed, 8-in.....	36.08	8.50	9.00	32.00	8.08	8.08	2,091	15.85	52.28																					
21	K57255	How, lt, SP, 105-mm.....	20.06	10.67	9.50	20.08	10.67	9.08	1,946	20.04	48.65																					
22	K57392	How, lt, towed, 105-mm.....	17.08	6.42	4.67	17.08	6.42	4.67	512	1.85	12.80																					
23	K57529	How, towed, 105-mm.....	19.83	7.25	5.83	19.83	7.25	5.83	839	2.39	20.98																					
24	K57666	How, mdm, SP, 155-mm.....	21.83	10.67	9.50	20.08	10.67	9.08	1,946	22.22	48.65																					
25	K57803	How, mdm, towed, 155-mm.....	24.67	8.08	7.67	24.67	8.08	7.67	1,529	6.27	38.23																					

Table 5-83—Continued

1			2			3			4			5			6			7			8			9			10			11		
1	LIN	Item	Operational dimensions			Reduced dimensions			Reduced cu ft	STON	Reduced MTON																					
			Length	Width	Height	Length	Width	Height																								
												(Dimensions—feet)																				
26	K57940	How, mdm, towed, 155-mm, aux propelled	24.42	9.17	6.50	24.42	9.17	6.50	1,455	6.80	36.38																					
27	L37013	Ldg veh, tracked, comd	29.00	11.75	10.08	29.00	11.75	10.08	3,436	32.10	85.90																					
28	L37030	Ldg veh, tracked, engr	39.75	18.67	10.75	39.75	18.67	10.75	7,977	16.38	199.43																					
29	L37118	Ldg veh, tracked, pers	29.67	11.75	10.08	29.67	11.75	10.08	3,515	34.89	87.88																					
30	L37132	Ldg veh, tracked, recov	31.75	11.75	17.33	31.75	11.75	10.75	4,010	37.51	100.25																					
31	L44164	Lchr, gren, acft, 40-mm	1.42	1.42	1.83	1.42	1.42	1.83	4	0.02	0.10																					
32	L44575	Lchr, gren, 40-mm	2.42	0.58	0.42	2.42	0.58	0.42	1	0.01	0.03																					
33	L45123	Lchr, rkt, multiple, 115-mm	8.67	7.50	6.00	8.33	5.92	6.00	296	0.62	7.40																					
34	L45260	Lchr, rkt, 3.5-in	3.00	2.75	1.25	3.00	2.75	1.25	10	0.08	0.25																					
35	L90805	Mg, cal .30, acft, lt	3.42	0.58	0.75	3.42	0.58	0.75	1	0.02	0.03																					
36	L90742	Mg, cal .30, lt, flex	4.42	0.58	0.75	4.42	0.58	0.75	2	0.02	0.05																					
37	L90879	Mg, cal .30, veh, lt	3.50	0.67	0.83	3.50	0.67	0.83	2	0.02	0.05																					
38	L91016	Mg, cal .50, acft, hv-fxd	5.17	0.67	0.83	5.17	0.67	0.83	3	0.05	0.08																					
39	L91153	Mg, cal .50, hv, fxd for carr M59, mort M84	5.75	0.58	0.75	5.75	0.58	0.75	3	0.06	0.08																					
40	L91290	Mg, cal .50, hv, fxd for comd recon carr M114A1	5.50	0.58	0.75	5.50	0.58	0.75	2	0.06	0.05																					
41	L91427	Mg, cal .50, hv, fxd for tk cbt, M48 ser	5.75	0.67	0.25	5.75	0.67	0.25	1	0.06	0.03																					
42	L91564	Mg, cal .50, hv, fxd multiple mounts	5.75	0.58	0.75	5.75	0.58	0.75	3	0.06	0.08																					
43	L91701	Mg, cal .50, hv, fxd-trt type	5.50	0.58	0.75	5.50	0.58	0.75	2	0.06	0.05																					
44	L91838	Mg, cal .50, hv, flex, veh-mtd	5.75	0.75	0.83	5.75	0.75	0.83	4	0.06	0.10																					
45	L91975	Mg, cal .50, hv, flex, for gnd use	4.16	0.83	0.92	4.16	0.83	0.92	4	0.04	0.10																					
46	L92112	Mg, cal .50, veh, hv, fxd	3.75	0.67	1.25	3.75	0.67	1.25	3	0.04	0.08																					
47	L92260	Mg, 7.62-mm, acft, lt, door-mtd	3.75	0.92	0.67	3.75	0.92	0.67	2	0.01	0.05																					
48	L92323	Mg, 7.62-mm, 6 bbl	2.92	0.92	0.92	2.92	0.92	0.92	2	0.02	0.05																					
49	L92352	Mg, 7.62-mm, fxd	3.17	0.58	0.67	3.17	0.58	0.67	1	0.02	0.03																					
50	L92386	Mg, 7.62-mm, lt, flex	3.67	1.08	0.92	2.92	1.08	0.92	3	0.03	0.08																					
51	M67871	Mort, 60-mm, on mount	2.75	1.17	1.25	2.75	1.17	1.25	4	0.04	0.10																					
52	M68008	Mort, 81-mm, on mount	4.58	1.83	0.75	4.58	1.83	0.75	6	0.05	0.15																					
53	M74755	Mount, mg, antiaircraft, cal .50	3.00	1.92	1.50	3.00	1.92	1.50	9	0.12	0.23																					
54	M75166	Mount, mg, tlr-mtd, multiple, cal .50	9.58	5.67	4.75	9.58	5.67	4.75	258	1.13	6.45																					
55	M75200	Mount, multiarmt-hel	3.58	1.67	3.17	3.58	1.67	3.17	19	0.12	0.48																					
56	M75440	Mount, tripod, mg, cal .50	2.83	0.75	1.17	2.83	0.75	1.17	2	0.03	0.05																					
57	M75577	Mount, tripod, mg, hv, cal .50	4.08	0.92	0.58	3.83	0.92	0.58	2	0.02	0.05																					
58	M75714	Mount, tripod, mg, 7.62-mm	2.58	0.67	1.17	2.25	0.67	0.50	1	0.01	0.03																					
59	M75851	Mount, tripod, rifle	4.17	0.92	1.00	4.17	0.92	1.00	4	0.05	0.10																					
60	N96193	Pistol, cal .22, auto, coml match shoot	0.75	0.17	0.75	0.75	0.17	0.75	1	0.01	0.03																					
61	N96330	Pistol, cal .22, auto, tng gr	0.75	0.50	0.08	0.75	0.50	0.08	1	0.01	0.03																					
62	N96467	Pistol, cal .32, auto	0.58	0.42	0.08	0.58	0.42	0.08	1	0.01	0.03																					
63	N96604	Pistol, cal .38, auto	0.58	0.42	0.08	0.58	0.42	0.08	1	0.01	0.03																					
64	N96741	Pistol, cal .45, auto	0.75	0.50	0.33	0.75	0.50	0.33	1	0.01	0.03																					
65	N96878	Pistol, cal .45, auto, natl match gr	0.92	0.50	0.33	0.92	0.50	0.33	1	0.01	0.03																					
66	R50543	Recov veh, FTRAC, lt-armd	20.83	10.33	10.92	20.83	10.33	10.92	2,350	23.50	58.75																					
67	R50680	Recov veh, FTRAC, mdm	27.17	11.25	10.58	27.17	11.25	10.68	3,235	54.00	80.88																					
68	R50817	Recov veh, FTRAC, hv	33.25	11.92	10.75	33.25	11.92	10.75	4,259	56.50	106.48																					
69	R90970	Revolver, cal .38, coml tgt match gr	0.67	0.50	0.17	0.67	0.50	0.17	1	0.01	0.03																					
70	R91107	Revolver, cal .38, 2-in bbl	0.58	0.42	0.17	0.58	0.42	0.17	1	0.01	0.03																					

Table 5-33—Continued

1			2			3			4			5			6			7			8			9			10			11		
1	LIN	Item	Operational dimensions			Reduced dimensions			Reduced cu ft	STON	Reduced MTON																					
			Length	Width	Height	Length	Width	Height																								
			(Dimensions—feet)																													
71	R91244	Revolver, cal .38, 4-in bbl.....	0.75	0.42	0.17	0.75	0.42	0.17	1	0.50	0.03																					
72	R94703	Rifle, cal .22, coml match shooting, gr M12.....	4.33	1.75	1.42	4.33	1.75	1.42	11	0.11	0.28																					
73	R94840	Rifle, cal .22, coml tng, gr M13.....	3.75	0.92	0.17	3.75	0.92	0.17	1	0.01	0.03																					
74	R95114	Rifle, 7.62-mm.....	3.75	0.50	0.25	3.75	0.50	0.25	1	0.01	0.03																					
75	R95251	Rifle, 7.62-mm, auto, with bipod.....	3.75	0.92	1.17	3.75	0.92	0.83	3	0.01	0.08																					
76	R95388	Rifle, 7.62-mm, natl match gr.....	3.75	0.50	0.25	3.75	0.50	0.25	1	0.01	0.03																					
77	R95799	Rifle, cal .30, snipers.....	3.67	0.75	0.17	3.67	0.75	0.17	1	0.01	0.03																					
78	R95936	Rifle, cal .30, coml tng gr.....	4.08	0.67	0.25	4.08	0.67	0.25	1	0.01	0.03																					
79	R96484	Rifle, rcl, 90-mm.....	4.42	1.58	1.58	4.42	1.58	1.58	11	0.02	0.28																					
80	R96758	Rifle, rcl, 106-mm, on mount.....	11.17	4.67	1.83	11.17	4.67	1.83	96	0.24	2.40																					
81	T39223	Shotgun, 12-g, riot-type, 20-in bbl.....	3.33	0.58	0.17	3.33	0.58	0.17	1	0.01	0.03																					
82	U56346	Smg, cal .45.....	2.50	0.67	0.33	2.50	0.67	0.33	1	0.01	0.03																					
83	V12826	Tk, cbt, FTRAC, 76-mm gun.....	27.00	10.50	10.17	23.33	10.50	10.17	2,491	21.25	62.28																					
84	V12963	Tk, cbt, FTRAC, 90-mm gun.....	24.42	12.00	10.25	23.50	12.00	9.75	2,750	49.00	68.75																					
85	V13100	Tk, cbt, FTRAC, 105-mm gun.....	27.08	12.00	10.67	27.08	12.00	10.33	3,358	48.75	83.95																					
86	V13237	Tk, cbt, FTRAC, 120-mm gun.....	37.17	12.33	9.50	37.17	12.33	9.50	4,355	58.50	108.88																					
87	V13269	Tk, cbt, FTRAC, 152-mm gun.....	23.00	11.75	10.83	23.00	11.75	10.83	2,928	50.00	73.20																					
88	V13374	Tk, cbt, FTRAC, flamethrower.....	22.83	12.00	10.25	22.83	12.00	10.25	2,809	50.00	70.23																					

Table 5-34. Class VII N (Special Weapons)—Weights and Cubes

1			2			3			4			5			6			7			8			9			10			11		
1	LIN	Item	Operational dimensions			Reduced dimensions			Reduced cu ft	STON	Reduced MTON																					
			Length	Width	Height	Length	Width	Height																								
			(Dimensions—feet)																													
2	E52453	Coll protective equip, CBR, M10.....	7.00	3.00	3.17	7.00	3.00	3.17	67	0.37	1.68																					
3	E67598	Compressor, recip, pwr-driven, 7-cfm.....	6.00	3.00	3.58	6.00	3.00	3.58	65	0.65	1.63																					
4	E74037	Compressor, recip, pwr-driven, flamethrower, 3½-cfm.....	2.25	1.50	2.08	2.25	1.50	2.08	7	0.06	0.18																					
5	F81880	Decon appar, pwr-driven, skid-mtd, multipurpose.....	12.33	7.67	4.83	12.33	7.67	4.83	457	1.62	11.43																					
6	F82154	Decon appar, pwr-driven, trk-mtd.....	21.83	7.92	8.75	21.83	7.92	7.42	1,282	8.00	32.05																					
7	G22109	Disperser, riot con agt, hel- or veh-mtd.....	7.25	1.50	2.50	7.25	1.50	2.50	27	0.13	0.68																					
8	G22246	Disperser riot con agt, ptbl.....	2.83	1.83	1.17	2.83	1.83	1.17	6	0.05	0.15																					
9	H50418	Fil unit, gas-particulate hosp, 6-man, 12-cfm.....	3.25	1.25	1.25	3.25	1.25	1.25	5	0.07	0.13																					
10	H68083	Flamethrower, ptbl.....	2.08	2.25	1.17	2.08	2.25	1.17	5	0.03	0.13																					
11	H68200	Flamethrower, mech, main armt APC-mtd.....	10.42	5.33	7.00	10.42	5.33	7.00	389	2.65	9.73																					
12	J30492	Genr, smoke, mech pulse jet.....	4.00	1.75	2.17	4.00	1.75	2.17	15	0.11	0.38																					
13	M10936	Mask, protective, tk.....	1.83	2.00	1.42	1.83	2.00	1.42	5	0.04	0.13																					
14	M12032	Mask, CBR, protective, tk.....	1.75	2.00	1.17	1.75	2.00	1.17	4	0.04	0.10																					
15	S79045	Svc unit, flamethrower, trk-mtd.....	22.08	8.08	9.50	22.08	1.25	9.25	255	8.79	6.38																					

Table 5-35. Class VII O (General Equipment)—Weights and Cubes

1			2			3			4			5			6			7			8			9			10			11		
1	LIN	Item	Operational dimensions			Reduced dimensions			Reduced cu ft	STON	Reduced MTON																					
			Length	Width	Height	Length	Width	Height																								
			(Dimensions—feet)																													
2	B30923	Barge, deck-cgo, nonpropelled, ocean, towing-----	420.00	33.00	50.17	420.00	33.00	50.17	695,310	151.20	17,382.75																					
3	B31060	Barge, deck-cgo, nonpropelled, sectionalized, nesting-----	81.00	22.00	7.00	81.00	22.00	7.00	12,474	130.00	311.85																					
4	B31197	Barge, deck- or liq-cgo, nonpropelled-----	420.00	33.00	8.50	420.00	33.00	8.50	117,810	78.00	2,945.25																					
5	B83582	Bt, brg-erection, inboard-eng, aluminum, gas-driven, 27-ft lg-----	27.17	8.17	5.67	27.17	8.17	5.67	1,257	3.65	31.43																					
6	B83856	Bt, ldg, inflatable, aslt-cft, nylon-cloth, 15-man-----	6.50	2.67	1.50	6.50	2.67	1.50	26	0.18	0.65																					
7	B83993	Bt, pax and cgo-----	65.58	17.67	8.83	65.58	17.67	8.83	10,235	74.00	255.88																					
8	B84267	Bt, picket, 52- to 65-ft-----	64.92	15.92	8.25	64.92	15.92	8.25	8,524	17.35	213.10																					
9	B84404	Bt, recon, pneu, 3-man-----	2.17	2.17	1.00	2.17	2.17	1.00	5	0.02	0.13																					
10	B84541	Bt, util-----	26.50	8.08	5.75	26.50	8.08	5.75	1,232	3.40	30.80																					
11	E40960	Clo rep shop, tlr-mtd, 2-whl-----	13.42	5.58	5.33	13.42	5.58	5.33	400	2.20	10.00																					
12	J04716	Fuel sys SUPPT, ptbl, 6,000-gal cap-----	3.58	4.92	2.42	3.58	4.92	2.42	43	0.12	1.08																					
13	L36602	LCM, 50- to 56-ft-----	64.17	14.00	13.33	64.17	14.00	13.33	11,978	26.70	299.45																					
14	L36739	LCM, 69-ft-----	73.67	21.08	13.67	73.67	21.08	13.67	21,226	64.90	530.65																					
15	L36876	LCV, 115-ft-----	115.00	34.00	21.75	115.00	34.00	21.75	85,043	160.00	2,126.08																					
16	L67234	Lighter, amph, SP, 2 ½- to 5-ton-----	35.00	10.00	10.17	35.00	10.00	7.92	2,771	10.00	69.28																					
17	L67371	Lighter, amph, SP, 15-ton-----	45.00	14.58	15.75	45.00	14.58	15.75	10,336	22.82	258.40																					
18	L67508	Lighter, amph, SP, diesel, steel, 60-ton, 61-ft-----	62.50	26.58	19.42	62.50	26.58	19.42	32,260	480.00	806.50																					
19	L85283	Lub and svc unit, pwr-op, tlr-mtd, 15-cfm air compressor, gas-driven, winterized-----	45.00	14.58	15.50	45.00	14.58	15.50	10,172	2.65	254.30																					

Section V. SUPPLY CLASSES II, IV, AND VIII**5-20. Class II Supply**

Table 5-36 provides weights and cubes for class II(E), secondary items—general supplies for TOE units.

5-21. Class IV Supply

Table 5-37 provides weights and cubes for construction and fortification materials.

5-22. Class VIII Supply

Table 5-38 provides weights and cubes for Army Medical Service (AMEDS) unit assemblages. Table 5-39 provides weights and cubes for class VIII items.

5-23. Notes on Other Classes

Most TOE items are in either class VII, class II, or class VIII. Dimensional or other characteristics data for classes VI, IX, and X will be included here when available.

Table 5-86. Class II E (General Supplies)—Weights and Cubes

1			2			3			4			5			6			7			8			9			10			11		
1	LIN	Item	Operational dimensions			Reduced dimensions			Reduced cu ft	STON	Reduced MTON																					
			Length	Width	Height	Length	Width	Height																								
												(Dimensions—feet)																				
2	A11810	Adapter, oxy sup, CBR mask, M8.....	0.50	0.42	0.50	0.50	0.42	0.50	1	0.01	0.03																					
3	B73697	Blasting mach, plunger-op, wood case, 50-cap cap.....	1.50	0.83	1.00	1.50	0.83	1.00	1	0.02	0.03																					
4	C19503	Breathing appar, compressed air.....	2.50	1.17	0.67	2.50	1.17	0.67	2	0.01	0.05																					
5	C19640	Breathing appar, oxy-genr.....	0.67	1.50	1.83	0.67	1.50	1.83	2	0.02	0.05																					
6	C19777	Breathing appar, self-entn.....	1.83	1.25	0.58	1.83	1.25	0.58	1	0.03	0.03																					
7	E57351	Combustible gas indic set, ptbl, coml.....	0.67	0.67	0.25	0.67	0.67	0.25	1	0.01	0.03																					
8	F80857	Decon and reimprg kit, indiv.....	0.33	0.25	0.17	0.33	0.25	0.17	1	0.04	0.03																					
9	G04300	Detector kit, cml agt.....	0.50	0.33	0.75	0.50	0.33	0.75	1	0.01	0.03																					
10	G04437	Detector kit, cml agt, VGH.....	1.67	1.50	0.92	1.67	1.50	0.92	2	0.02	0.05																					
11	M11210	Mask, CBR, dog.....	2.33	1.33	1.25	2.33	1.33	1.25	4	0.03	0.10																					
12	M12717	Mask, gas, all-purpose.....	2.50	1.42	0.83	2.50	1.42	0.83	3	0.04	0.08																					
13	O93303	Rada source set.....	2.58	1.17	1.25	2.58	1.17	1.25	4	0.08	0.10																					
14	R87148	Respirator, air fil.....	3.42	0.50	0.42	3.42	0.50	0.42	1	0.01	0.03																					
15	R88578	Resuscitation tube, protective mask, M1 ser.....	0.33	0.25	0.25	0.33	0.25	0.25	1	0.01	0.03																					
16	S29227	Safety equip set, respiratory, gas-tk cleaning.....	3.33	1.83	1.00	3.33	1.83	1.00	6	0.11	0.15																					
17	S29577	Sampling and anal kit, CBR agts, M19.....	2.00	0.75	1.33	2.00	0.75	1.33	2	0.02	0.05																					
18	S29795	Sampling kit, CBR agt.....	0.83	0.42	0.50	0.83	0.42	0.50	1	0.02	0.03																					
19	X93072	Valve, antiback draft, protective shltr.....	3.42	0.50	0.42	3.42	0.50	0.42	1	0.02	0.03																					
20	Y37267	Water testing kit, cml agts.....	0.50	0.25	0.33	0.50	0.25	0.33	1	0.01	0.03																					
21	Y37404	Water testing kit, poisons.....	2.00	1.67	0.92	2.00	1.67	0.92	3	0.03	0.08																					

Table 5-37. Construction and Fortification Materials—Weights and Cubes

1	1 Item	2 MTON	3 STON
2	Brick, masonry, pressed.....	1.00	2.80
3	Brick, masonry, common.....	1.00	2.40
4	Brick, masonry, soft.....	1.00	2.00
5	Cement, portland, loose.....	1.00	1.80
6	Cement, portland, set.....	1.00	3.70
7	Concrete masonry.....	1.00	2.40
8	Dynamite, military (50 lb per box).....	1.00	1.00
9	Earth, dry, loose.....	1.00	1.50
10	Earth, dry, packed.....	1.00	1.90
11	Gravel, loose.....	1.00	2.10
12	Rock, crushed.....	1.00	2.00
13	Rubble, dry, masonry.....	1.00	2.60
14	Sand, dry.....	1.00	1.80
15	Sand, gravel.....	1.00	2.00
16	Tar, bituminous.....	1.00	1.50
17	White pine.....	1.00	0.60
18	Detonating cord, 3,000 ft per box (100 boxes).....	6.30	3.80
19	Time fuze, blasting (100 boxes).....	9.80	4.70
20	Railroad track, 98 lb per m, rail per km of single track.....	29.76	98.27
21	Railroad track, rail turnout, complete, 98 lb per m (each).....	4.15	5.95
22	Pipe, 4-in. lt, with couplings (100 20-ft sec).....	6.50	4.50
23	Pipe, 4-in. std, with couplings (100 20-ft sec).....	6.50	10.40
24	Pipe, 6-in. lt, with couplings (100 20-ft sec).....	14.10	9.20
25	Pipe, 6-in. std, with couplings (100 20-ft sec).....	14.10	15.70
26	Pipe, 8-in. lt, with couplings (100 20-ft sec).....	24.40	11.70
27	Pipe, 8-in. std, with couplings (100 20-ft sec).....	24.40	23.50
28	Pipe, 12-in. lt, with couplings (100 20-ft sec).....	52.40	21.80
29	Pipe, 12-in. std, with couplings (100 20-ft sec).....	52.40	43.20
30	Pipe, 16-in. std, welded (100 20-ft sec).....	82.30	52.40
31	Tank, steel-bolted, 1,000-bbl.....	11.50	10.75
32	Tank, steel-bolted, 3,000-bbl.....	30.00	17.00
33	Tank, steel-bolted, 10,000-bbl.....	70.30	44.10
34	Tank, collapsible, 238-bbl, with hose manifold.....	2.10	0.70

Table 5-38. Army Medical Service Unit Assemblages

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Line item number	Major med equip set	Med equip set(s)						Other commodity comd						Totsl unit TOE assemblage					
			Number of lines	Number of packages	STON	Cubage	Car-loads	Sq ft of stor space	Number of lines	Number of packages	STON	Cubage	Car-loads	Sq ft of stor space	Total number of lines	Total number of pack-ages	Total STON	Total cubage	Total car-loads	Total sq ft of Stor space
2	M22738	Conv cen, army, 1,500-pnt.....	970	814	30.7	4,636	2	450	495	4,400	260.0	31,400	13	4,000	1,140	3,520	292.1	35,863	15	4,450
3	M22875	Conv cen, army, expansion, 1,500-pnt.....	507	481	19.3	3,290	1	265	170	2,706	138.2	12,612	6	1,500	1,002	4,881	159.6	15,216	7	1,765
4	M23012	Med lab, army, ptbl.....	3,132	852	18.1	2,450	1	365	-----											
5	M23149	Med lab, army, smbl.....	1,848	249	2.8	10	1	144	-----											
6	M24519	Disp, COMMZ...	388	65	2.21	310	LCL	35	-----											
7	M25067	Evac hosp, 400-bed, smbl..	2,631	975	31.75	3,896	13	665	249	1,052	72.2	8,221	3	1,040	2,880	2,027	114.0	14,823	16	1,705
8	M25204	Fld hosp, hospitalization unit, mbl.....	902	472	15.6	2,100	1	253	-----											
9	M25752	Gen disp, COMMZ, type 1.....	656	98	1.69	148	LCL	56	233	51	2.0	218	LCL	27	889	149	6.6	783	LCL	83
10	M25889	Gen disp, COMMZ, type 2.....	596	170	3.23	289	LCL	85	64	45	2.0	90	LCL	11	680	215	8.6	942	LCL	96
11	M26163	GH, 1,000-bed, COMMZ.....	2,887	3,709	108.7	-----	15	3,440	335	2,105	125.0	13,638	6	1,800	3,222	5,814	358.9	47,761	21	5,240
12	M26300	Sta hosp, 100-bed..	1,882	478	25.85	3,620	2	450	388	397	22.8	3,023	1	320	2,220	875	55.0	7,440	3	770
13		Sta hosp, 200-bed..	1,950	790	39.85	5,760	3	760	235	810	25.9	3,328	1	400	2,185	1,600	72.5	9,729	4	1,160
14	M26437	Sta hosp, 250-bed.....			42.5	6,930	-----													
15	M26505	Sta hosp, 300-bed..	2,608	1,130	53.15	7,047	4	860	290	387	45.9	6,502	2	3,036	2,898	1,517	106.0	15,016	6	3,896
16	M26574	Sta hosp, 500-bed..	2,550	1,735	63.1	-----	6	1,260	483	1,282	99.6	12,185	6	1,660	3,033	3,017	182.1	24,653	12	2,920
17	M26711	Sta hosp, 750-bed..	2,778	2,271	81.7	-----	9	2,350	512	1,852	110.6	12,803	6	1,750	3,290	4,123	238.2	36,055	15	4,100
18	M27533	Hosp expansion, 20-bed.....			3.45	50	-----													
19	M27670	Hosp expansion, 25-bed.....	399	-----	3.73	543	LCL	60	-----											
20	M27807	Hosp expansion, 50-bed.....	408	171	6.4	984	LCL	112	-----											
21	M28081	Hosp expansion, 100-bed.....	463	279	14.0	2,140	1	300	-----											
22	M29177	MASH, 60-bed....	1,167	406	17.55	2,556	1	185	165	514	26.3	2,985	1	300	1,332	920	42.3	5,343	2	485

Table 5-39. Class VIII—Weights and Cubes

1			2			3			4			5			6			7			8			9			10			11		
1LINItem			Operational dimensions						Reduced dimensions						Reduced cu ft			STON			Reduced MTON											
			Length			Width			Length			Width												Height								
			(Dimensions—feet)																													
2	B11174	Back-rest litter, nonadj.....	0.25	1.67	2.33	0.25	1.67	2.33	1	0.01	0.03																					
3	B39431	Basin, emesis, corrosion-resisting stl.....	0.50	0.33	0.83	0.50	0.33	0.83	1	0.01	0.03																					
4	B55971	Bedpan, corrosion-resisting stl.....	1.00	0.42	1.17	1.00	0.42	1.17	1	0.01	0.03																					
5	C49450	Cabinet, med, comb, corrosion resisting stl, with narcotic locker.....	1.50	3.08	6.58	1.50	3.08	6.58	30	0.14	0.75																					
6	C52190	Cabinet, surgical inst, corrosion-resisting stl, 16x36x72-in.....	3.33	1.67	6.67	3.33	1.67	6.67	37	0.20	0.93																					
7	C52327	Cabinet, surgical inst and dressing, corrosion-resisting stl, 16x30x60-in.....	1.50	2.67	5.17	1.50	2.67	5.17	21	0.20	0.53																					
8	D84791	Chair, hosp, ward, metal, green.....	1.67	2.67	3.17	1.67	2.67	3.17	14	0.01	0.35																					
9	E11657	Chest, med inst and sup set, fld no 2, empty, 30x18x6-in.....	2.58	1.58	0.58	2.58	1.58	0.58	2	0.01	0.05																					
10	E11794	Chest, med inst and sup set, fld no 4, empty, 30x18x12-in.....	2.58	1.58	1.17	2.58	1.58	1.17	5	0.02	0.13																					
11	F98774	Desk, flat-top, nur, sgl-pedestal, corrosion-resisting metal.....	2.08	2.17	3.33	2.08	2.17	3.33	15	0.10	0.38																					
12	G96668	Egg insp set, vet.....	1.50	1.00	0.58	1.50	1.00	0.58	1	0.01	0.03																					
13	H10793	Entomological coll kit, fld.....	2.00	1.00	0.50	2.00	1.00	0.50	1	0.03	0.03																					
14	H84091	Food insp set, vet.....	2.00	1.00	0.50	2.00	1.00	0.50	1	0.03	0.03																					
15	H84228	Food insp set, vet, fld.....	0.83	0.67	0.67	0.83	0.67	0.67	1	0.01	0.03																					
16	L62213	Lt, ir, phys therapy, 220-w, 110-v, ac-dc.....	2.92	0.92	0.83	2.92	0.92	0.83	2	0.01	0.05																					
17	L65090	Lt, surgical bkt, ptbl, btry-op.....	0.75	0.75	0.75	0.75	0.75	0.75	1	0.01	0.03																					
18	L65227	Lt, surgical, fld, 110-v, ac-dc or btry-op.....	2.83	1.67	1.00	2.83	1.67	1.00	5	0.06	0.13																					
19	L66323	Lt, ultraviolet, specimen-exam, 110-v, 60-cy, ac or btry-op.....	1.25	0.75	1.00	1.25	0.75	1.00	1	0.02	0.03																					
20	L74118	Litter, folding, folding-pole, aluminum pole.....	7.50	1.75	0.08	7.50	1.75	0.08	1	0.01	0.03																					
21	L74255	Litter, folding, rigid pole, aluminum pole.....	7.58	1.75	0.50	7.58	1.75	0.50	7	0.01	0.18																					
22	L74529	Litter, rigid stokes.....	7.50	1.75	0.08	7.50	1.75	0.08	1	0.02	0.03																					
23	M31232	Med inst and sup set, disp, fld.....	2.50	1.50	0.50	2.50	1.50	0.50	2	0.04	0.05																					
24	M31369	Med inst and sup set, PVNTNED surv det.....	2.50	1.50	0.50	2.50	1.50	0.50	2	1.64	0.05																					
25	M31506	Med inst and sup set, PVNTMED con det.....	2.50	1.50	0.50	2.50	1.50	0.50	2	0.53	0.05																					
26	M31643	Med sup set, fld, suppl sup.....	2.50	1.50	0.50	2.50	1.50	0.50	2	0.02	0.05																					
27	N48588	Pad, op-table, 2 sec.....	0.50	0.50	0.92	0.50	0.50	0.92	1	0.03	0.03																					
28	U27290	Stand, surgical inst, adj, corrosion-resisting stl.....	1.67	2.00	5.33	1.67	2.00	5.33	18	0.04	0.45																					
29	U27427	Stand, surgical inst, adj, olive-drab enameled.....	2.17	1.25	0.17	2.17	1.25	0.17	1	0.01	0.03																					
30	U38400	Ster, surgical dressing, pressure-fuel-heated, corrosion-resisting metal, 16x24-in.....	1.67	3.00	4.00	1.67	3.00	4.00	20	0.25	0.50																					
31	U38811	Ster, surgical inst-dressings, pressure-elec heated, corrosion-resisting stl, auto, 110-v, 60-cy.....	2.00	1.17	1.50	2.00	1.17	1.50	4	0.02	0.10																					
32	U38948	Ster, surgical inst-dressings, pressure-elec-fuel heated, corrosion-resisting stl, auto.....	2.08	1.25	1.58	2.08	1.25	1.58	4	0.05	0.10																					
33	U39016	Ster, surgical inst-dressings, pressure ext-heated, corrosion-resisting stl, 12½x12½-in.....	1.25	1.25	2.00	1.25	1.25	2.00	3	0.02	0.08																					
34	U39054	Ster, surgical dressings, pressure-fuel heated, corrosion-resisting stl, 16x36-in.....	1.50	3.17	3.00	1.50	3.17	3.00	14	0.01	0.35																					
35	U39070	Ster, surgical inst, pressure-elec/ext-heated, corrosion-resisting stl, 6½x12-in, 50/60-cy, ac-dc.....	1.33	0.58	0.75	1.33	0.58	0.75	1	0.01	0.03																					
36	U41907	Stool, revolving, surg's, corrosion-resisting metal.....	1.33	1.33	1.50	1.33	1.33	1.50	3	0.02	0.08																					
37	U61925	Spt litter, folding.....	2.75	0.67	0.42	2.75	0.67	0.42	1	0.01	0.03																					
38	U65069	Surg inst and sup set, cbt.....	2.50	1.50	0.50	2.50	1.50	0.50	2	0.02	0.05																					
39	U65480	Surg inst and sup set, indiv.....	2.50	1.50	0.50	2.50	1.50	0.50	2	0.01	0.05																					
40	U65754	Surg inst and sup set, vet, indiv.....	2.50	1.50	1.67	2.50	1.50	1.67	6	0.01	0.15																					

Table 5-39—Continued

Table 3-55—Continued														
1			2			3	4	5	6	7	8	9	10	11
1	LIN	Item	Operational dimensions			Reduced dimensions			Reduced cu ft	STON	Reduced MTON			
			Length	Width	Height	Length	Width	Height						
			(Dimensions—feet)											
41	U93614	Table, folding legs, lab.....	1.92	0.25	2.33	1.92	0.25	2.33	1	0.02	0.03			
42	U99779	Table, op, fld.....	2.50	3.42	0.92	2.50	3.42	0.92	8	0.05	0.20			
43	U99916	Table, op, fld.....	1.33	1.83	0.83	1.33	1.83	0.83	2	0.08	0.05			
44	V01287	Table, pnt-exam, corrosion-resisting stl.....	5.00	1.83	2.67	5.00	1.83	2.67	24	0.08	0.60			
45	V02109	Table, surgical inst and surgical dressings, corrosion-resisting stl.....	2.75	1.50	2.67	2.75	1.50	2.67	11	0.03	0.28			
46	X25251	Tray, inst, corrosion-resisting stl, 10½x8x2-in.....	1.00	0.83	0.33	1.00	0.83	0.33	1	0.01	0.03			
47	X87750	Urinal, male pnt, corrosion-resisting stl.....	0.50	0.50	0.75	0.50	0.50	0.75	1	0.01	0.03			

Section VI. CONSUMPTION RATES

5-24. General

This section covers the consumption and flow charts dealing with resupply factors derived from World War II experience. As more recent factors become available, they will replace the factors applicable to similar situations (intensity, terrain).

5-25. Consumption Flow Charts

a. This paragraph illustrates (fig. 5-1 through 5-11) the flow of replacement and consumption (R&C) supplies from the continental United States (CONUS) or local theater procurement agencies to a large landmass theater of operations. It should be noted that the basic figures are derived from World War II experience, modified as indicated.

b. The unit of measure, STON per division slice, is considered the most appropriate for long-range planning for resupply of the Army and Air Force in a theater of operations. The division slice is defined (para 2-7b(1)) as including the strength of an average division plus proportionate shares of the total corps, field army zone, and theater overhead units. A troop location ratio has been assumed and is illustrated by the human silhouettes in figure 5-1. Each silhouette represents approximately 10,000 of the 51,955 men making up the theater division slice. For illustrative purposes in the charts below, all divisions in the theater presumably are occupying sectors along the front. In practice, varying proportions of these troops will be in reserve, in rest areas, in transit, or in staging. Also shown similarly is the proportionate air strength in the theater, based on a ratio of two air wing slices (defined in para 2-7b(2)) per division slice.

c. The charts include, besides the supplies consumed by the Army in the theater, the quantities of supplies brought into the theater for U.S. Air Force use. All are shown in terms of STON per division slice per day. In all instances figures based on Air Force strength include those Army troops, part of the air wing slice, required in the theater because of the presence of Air Force elements, which are provided Army combat service support. A horizontal dotted line (fig. 5-1) separates the quantity of supplies brought into the theater for the Army from those supplies brought in for the Air Force.

d. The flow of supplies, in terms of STON per division slice per day, shown in each of the charts is supported by pounds-per-man-per-day data indicated beneath each chart.

e. Procurement in the theater is indicated in each chart, except for classes V(W) and V(A), as a possible source of supply. The quantity thus available would decrease proportionately the amount to be procured from the CONUS.

f. Buildup of theater levels is not included in this series of charts. However, this buildup can be determined by a fractional increase in the amounts shown. For example, to establish a theater reserve of 30 days of supply and to accomplish this buildup in 120 days, a fractional increase of 30/120, or one-fourth, can be made in the amounts shown here.

g. Figures 5-2 through 5-11 are planning figures updated to the new 10 classes of supply using study data because actual data have not yet been developed. Appendix B contains actual World War II data.

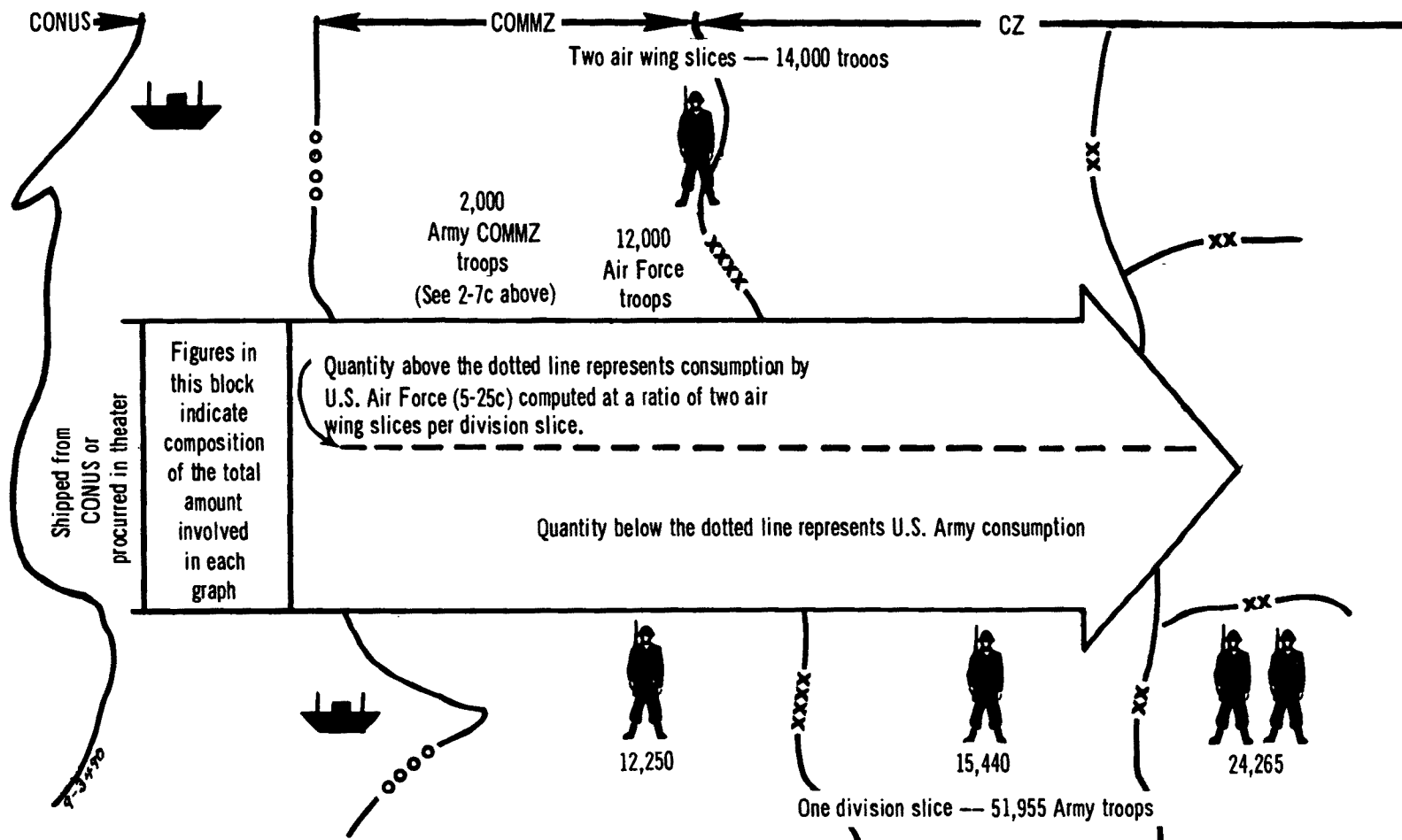
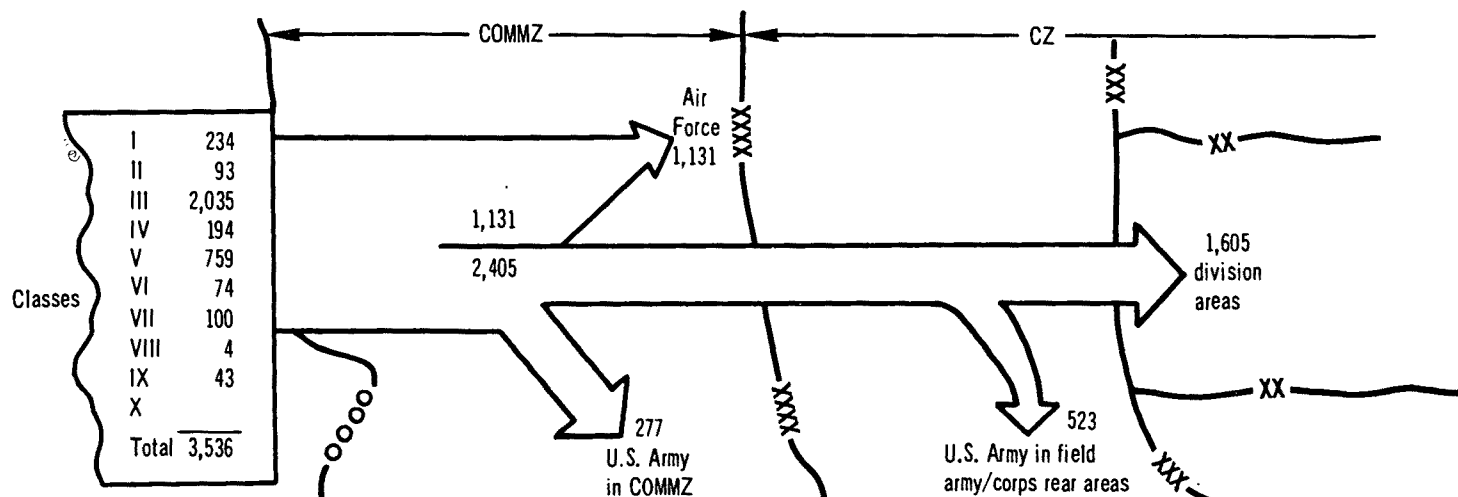


Figure 5-1. Consumption flow chart—personnel.



POUNDS PER DAY							
Classes	Consumed per man in theater, Army plus Air Force	Consumed by Army in theater per Army man in theater	Consumed by Air Force in theater per Air Force man in theater ^a	Consumed by Army in COMMZ per Army man in COMMZ	Consumed by Army in combat zone per Army man in combat zone	Consumed by Army in field army and corps rear areas per Army man in such areas	Consumed by Army in division areas per Army man in such areas
I	7.20	7.31	6.70	8.80 ^b	6.70	6.70	6.70
II	2.82	3.26	0.83	3.35	3.23	3.21	3.25
III	61.70	47.80	125.00	32.40	53.10	38.20	62.60
IV	5.88	6.80	1.73	7.00	6.75	6.70	6.77
V	23.00	23.40	25.40	2.40	29.70	5.20	45.30
VI	2.23	2.59	0.66	2.65	2.57	2.55	2.58
VII	3.04	3.51	0.89	3.60	3.47	3.45	3.50
VIII	0.12	0.14	0.04	0.14	0.14	0.14	0.14
IX	1.31	1.52	0.39	1.56	1.51	1.50	1.52
X							
Total	107.30	96.33	161.64	61.90	107.17	67.65	132.36

^aIncludes Army troops required within the theater because of the presence of Air Force elements.

^bThis relatively greater figure is a result of the inclusion in this column of diversions to civilians, prisoners of war, and Allies and miscellaneous theater-wide losses.

Figure 5-2. Short tons per division slice per day—all classes.

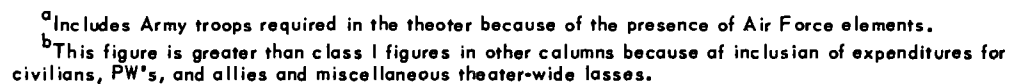
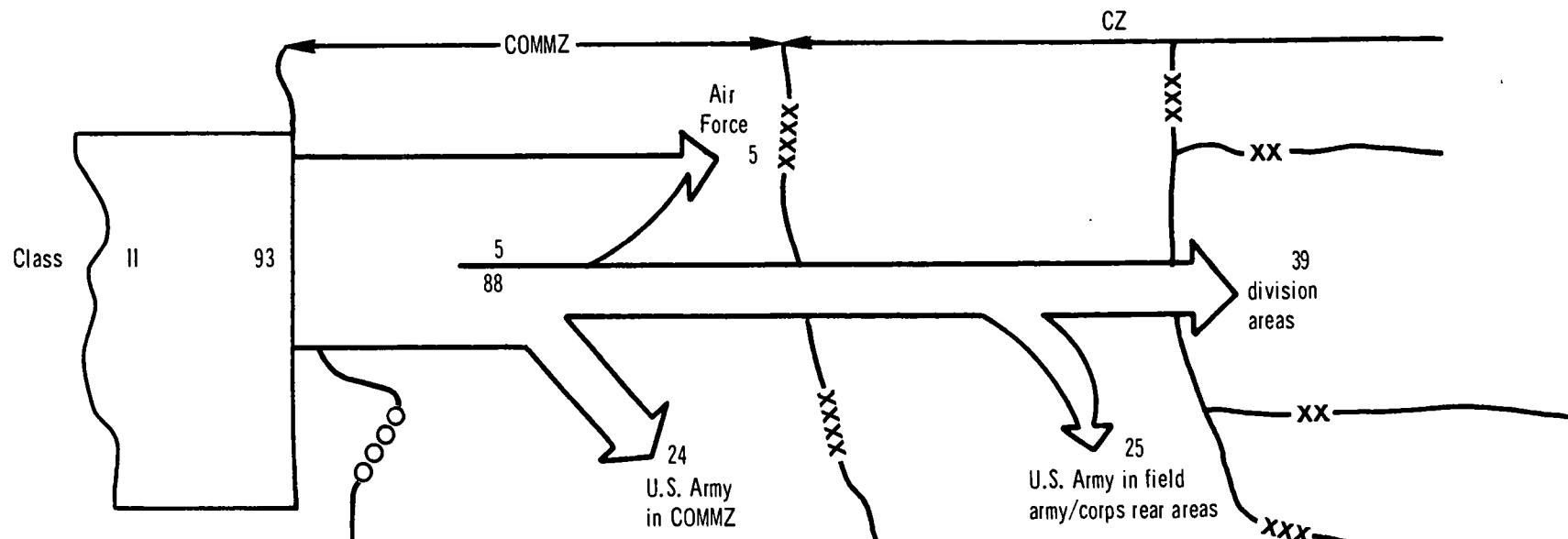


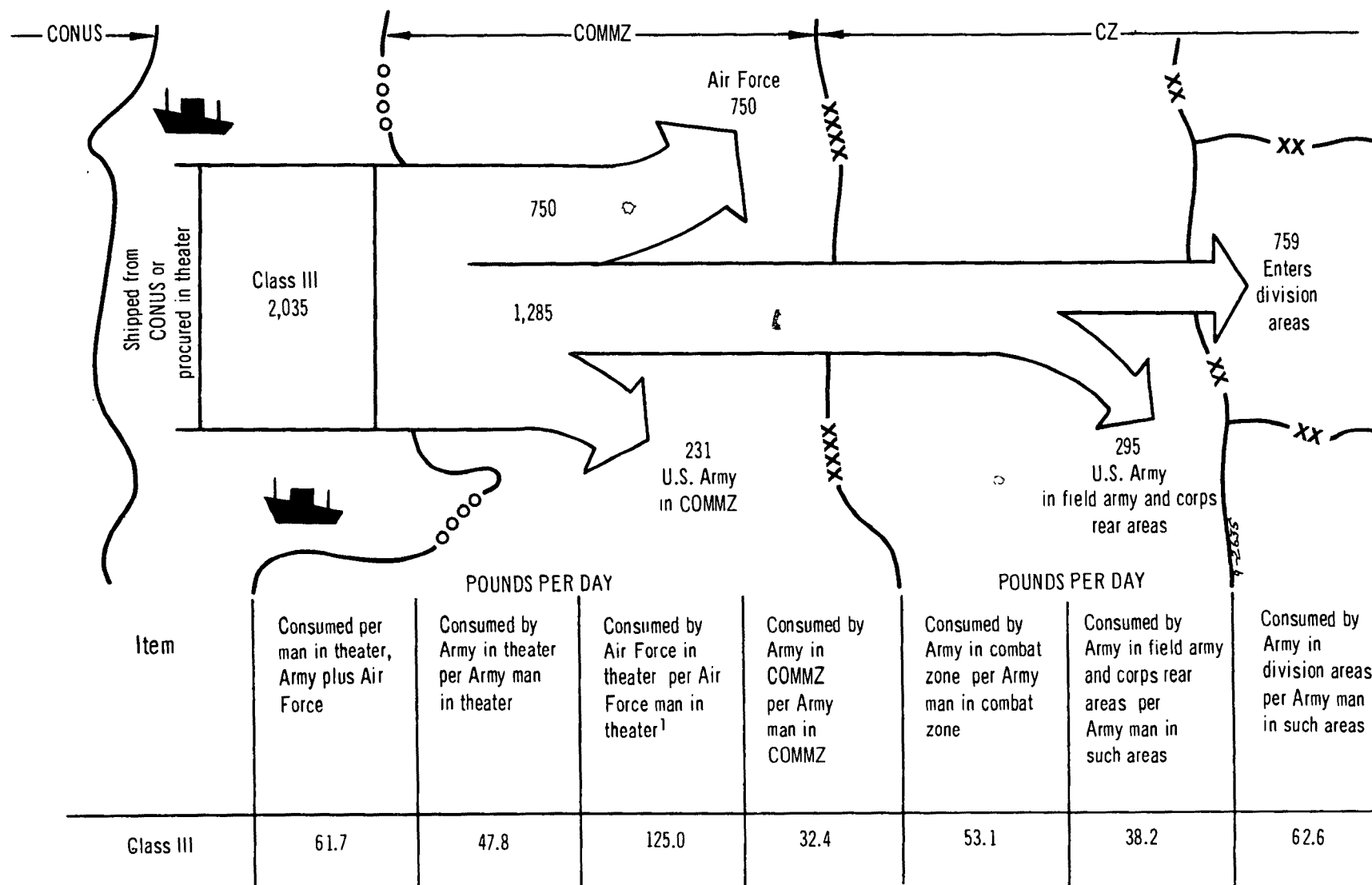
Figure 5-3. Short tons per division slice per day—class I.



POUNDS PER DAY							
Class	Consumed per man in theater, Army plus Air Force	Consumed by Army in theater per Army man in theater	Consumed by Air Force in theater per Air Force man in theater ¹	Consumed by Army in COMMZ per Army man in COMMZ	Consumed by Army in combat zone per Army man in combat zone	Consumed by Army in field army and corps rear areas per Army man in such areas	Consumed by Army in division areas per Army man in such areas
II	2.82	3.26	0.83	3.35	3.23	3.21	3.25

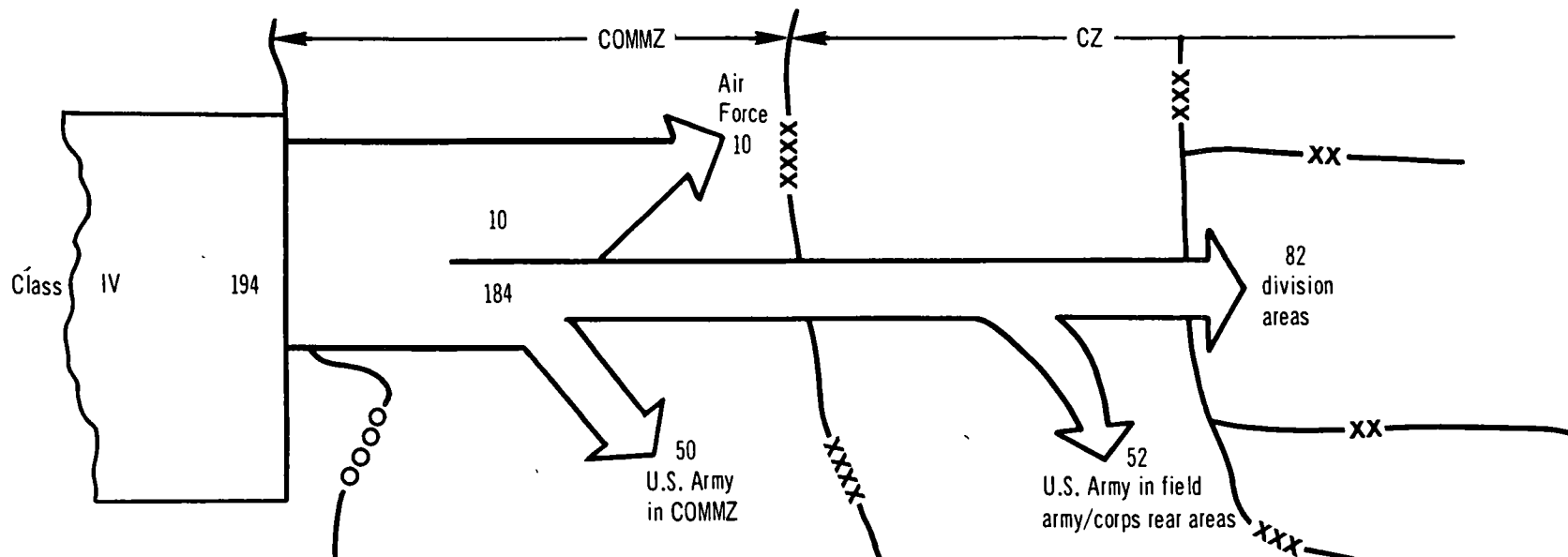
¹Includes Army troops required within the theater because of the presence of Air Force elements.

Figure 5-4. Short tons per division slice per day—class II.



¹Includes Army troops required in the theater because of the presence of Air Force elements.

Figure 5-5. Short tons per division slice per day—class III.



POUNDS PER DAY							
Class	Consumed per man in theater Army plus Air Force	Consumed by Army in theater per Army man in theater	Consumed by Air Force in theater per Air Force man in theater ¹	Consumed by Army in COMMZ per Army man in COMMZ	Consumed by Army in combat zone per Army man in combat zone	Consumed by Army in field army and corps rear areas per Army man in such areas	Consumed by Army in division areas per Army man in such areas
IV	5.88	6.80	1.73	7.00	6.75	6.70	6.77

¹Includes Army troops required within the theater because of the presence of Air Force elements.

9-2635

Figure 5-6. Short tons per division slice per day—class IV.

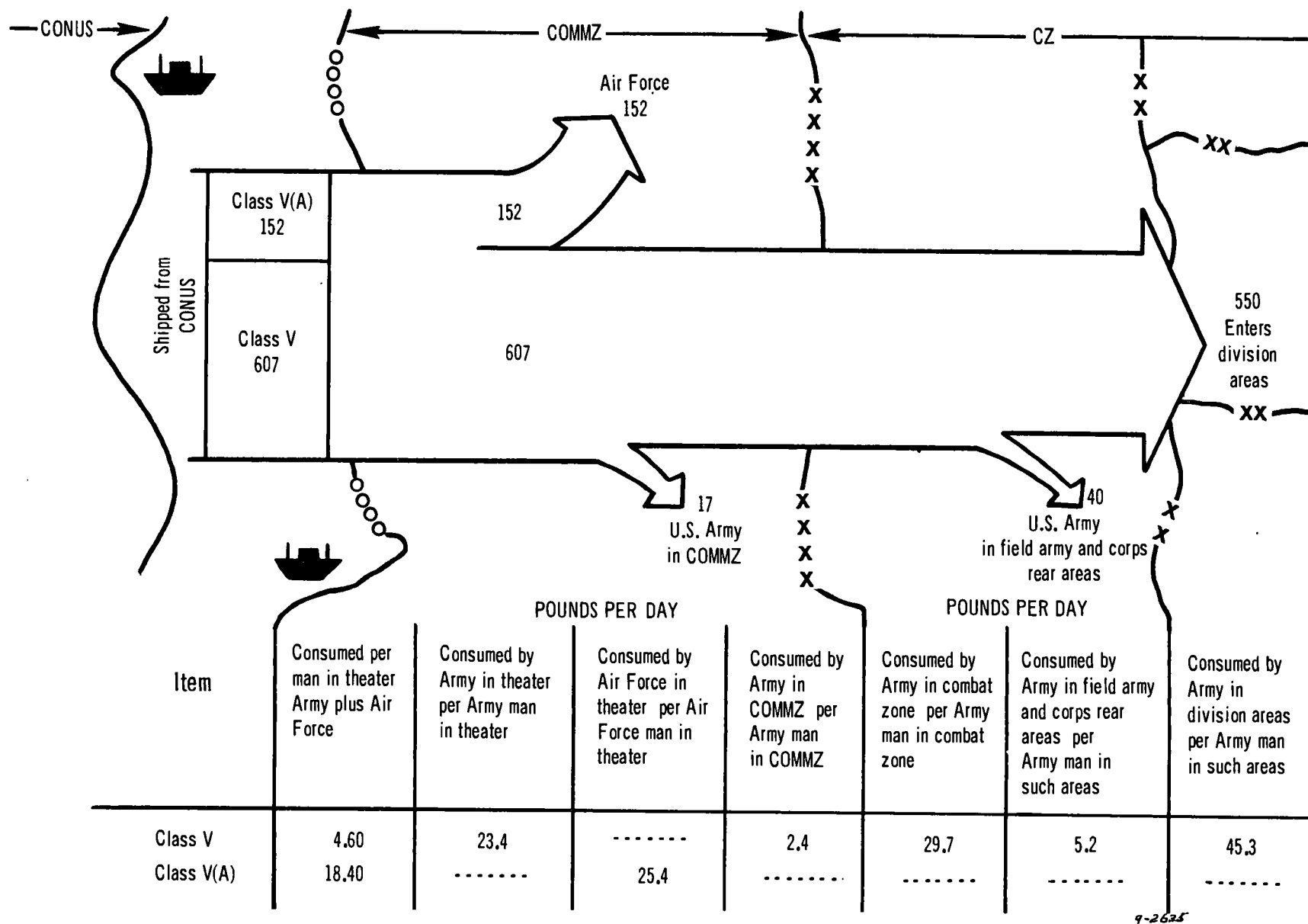
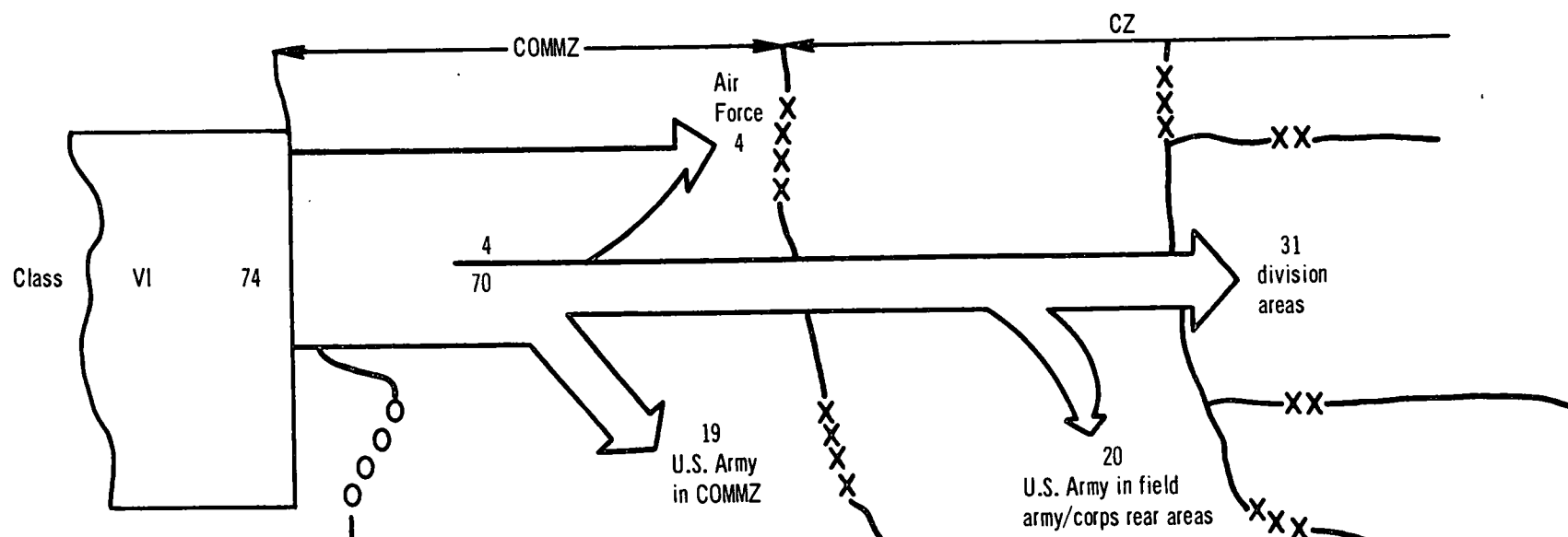


Figure 5-7. Short tons per division slice per day—classes V and V(A).

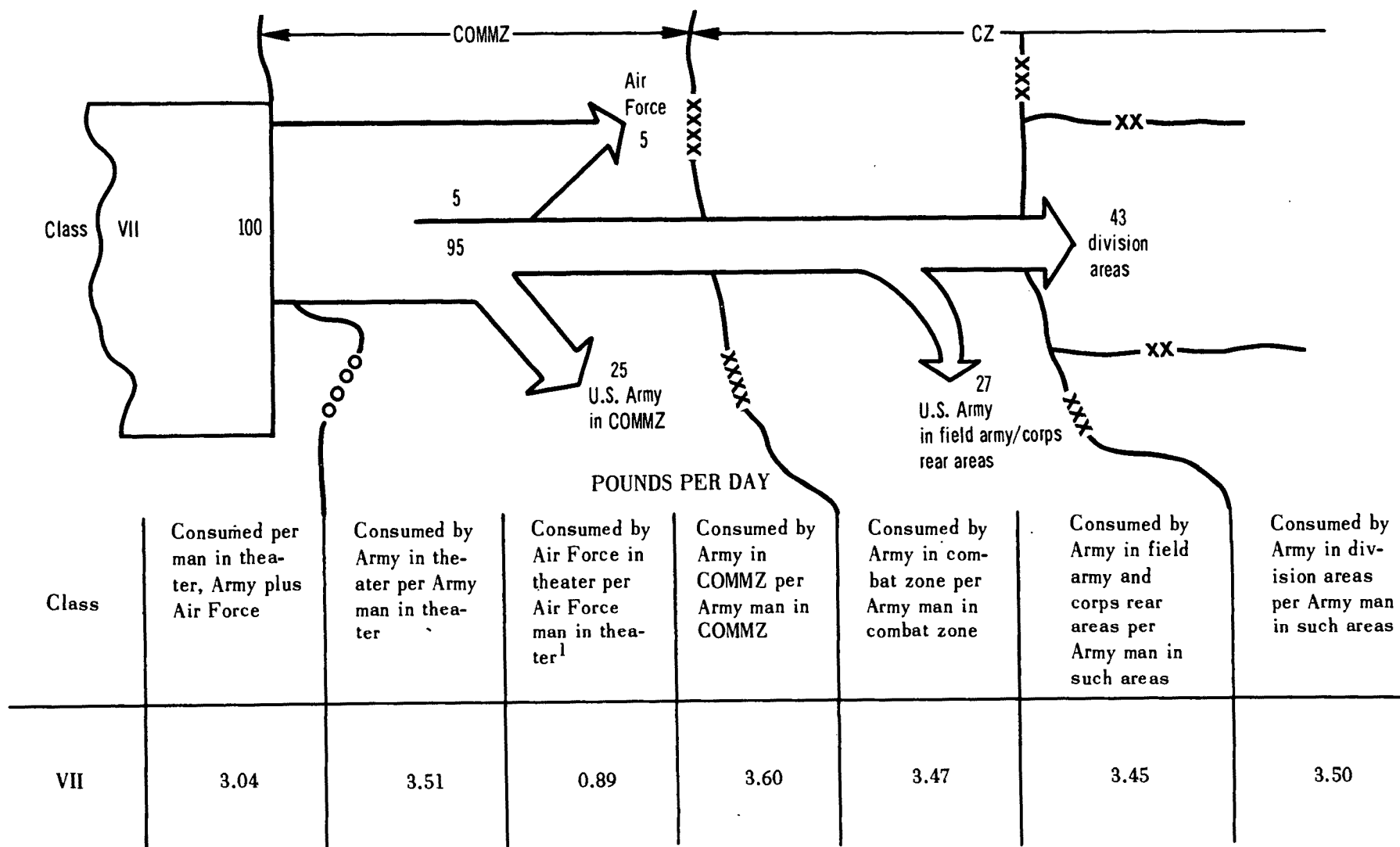


POUNDS PER DAY

Class	Consumed per man in theater, Army plus Air Force	Consumed by Army in theater per Army man in theater	Consumed by Air Force in theater per Air Force man in theater ¹	Consumed by Army in COMMZ per Army man in COMMZ	Consumed by Army in combat zone per Army man in combat zone	Consumed by Army in field army and corps rear areas per Army man in such areas	Consumed by Army in division areas per Army man in such areas
VI	2.23	2.59	0.66	2.65	2.57	2.55	2.58

¹Includes Army troops required within the theater because of the presence of Air Force elements.

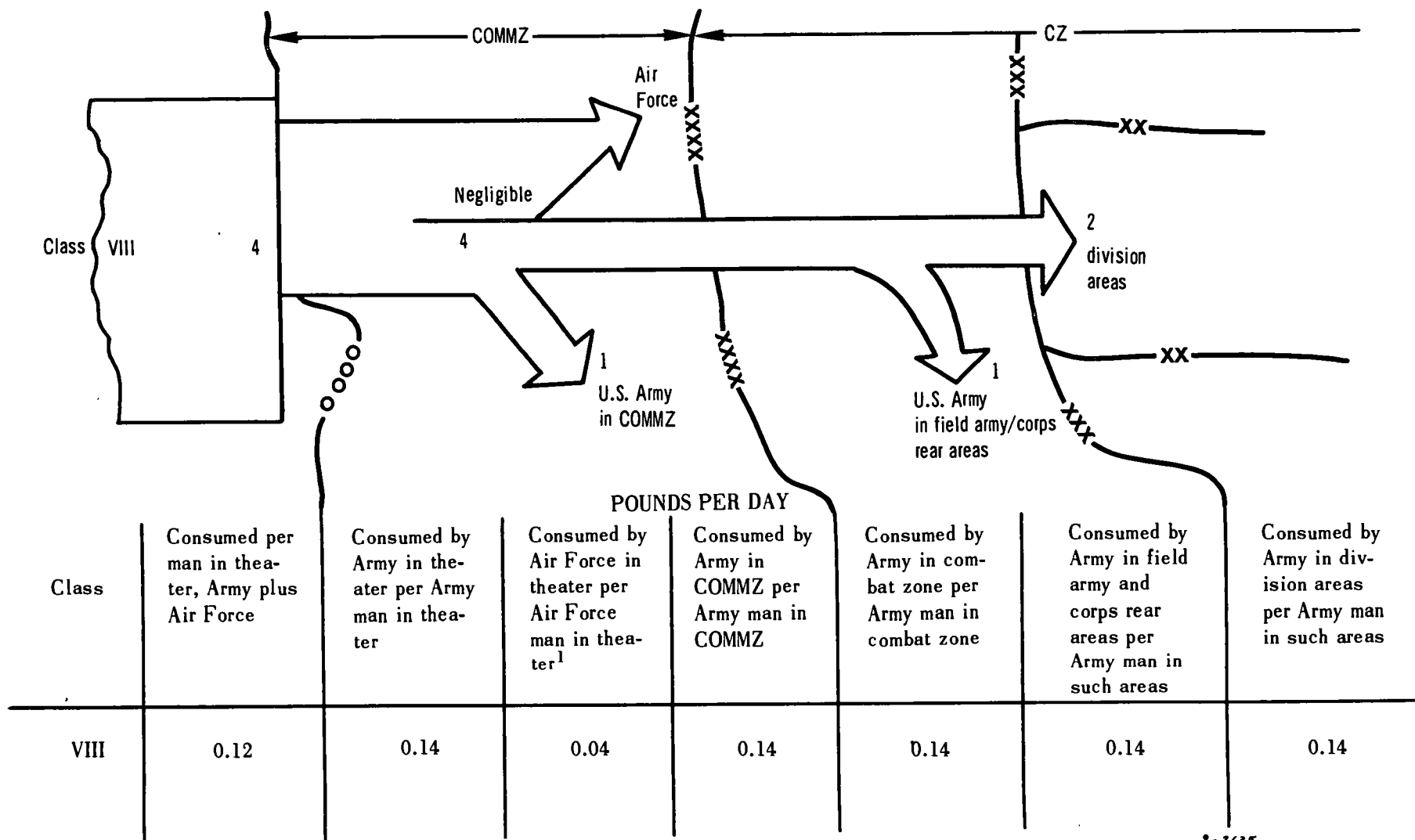
Figure 5-8. Short tons per division slice per day—class VI.



¹Includes Army troops required within the theater because of the presence of Air Force elements.

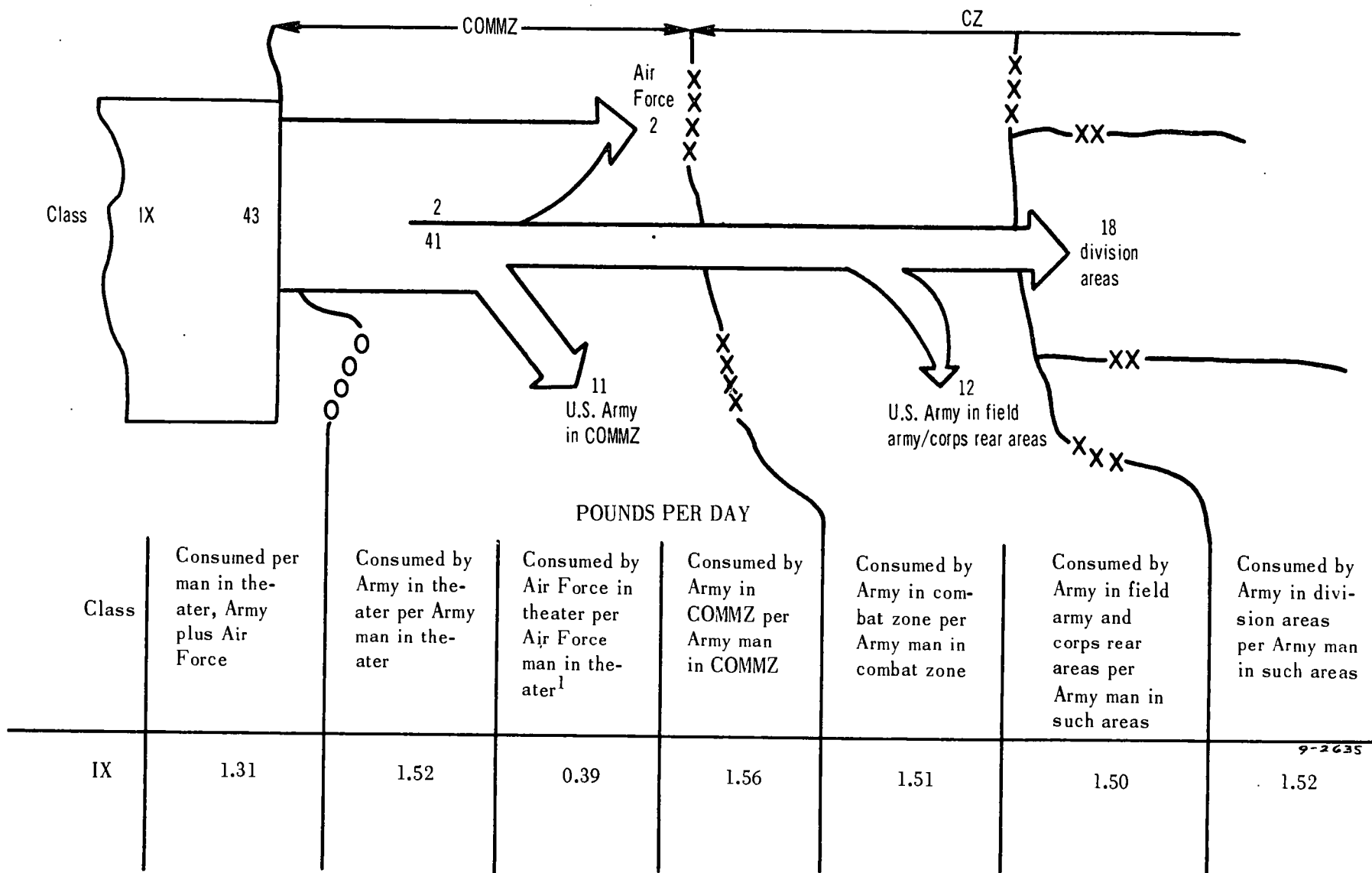
Figure 5-9. Short tons per division slice per day—class VII.

9-2615



¹Includes Army troops required within the theater because of the presence of Air Force elements.

Figure 5-10. Short tons per division slice per day—class VIII.



¹Includes Army troops required within the theater because of the presence of Air Force elements.

Figure 5-11. Short tons per division slice per day—class IX.

5-26. Consumption Rates

a. Table 5-40 provides comparative consumption rates for the new 10 classes of supply:

(1) Column 2 represents the United States Army, Europe (USAREUR), rates approved by the Joint Chiefs of Staff for planning purposes.

(2) Column 3 represents figure 5-2 of the previous edition of this manual. Classes II through IV have been apportioned to the new classes according to a study made of more recent expenditures.

b. Table 5-41 shows sample computations involving application of table 5-40, column 2, for an airlift of the aviation battalion, infantry division (TOE 1-75G) under the following conditions:

(1) Personnel are weighed at 240 pounds, an average that includes individual equipment and clothing. TOE strength is 367.

(2) TOE equipment comprises the weights and cubages listed herein. Vehicle fuel tanks and containers will be three-fourths full.

(3) Accompanying supplies: The major classes of supply are I, III, and V. Class II, IV, VI, VII, VIII, IX, and X supplies are limited to critical items based on a 15-day requirement, whereas the major classes differ as follows:

(a) Class I supply is based on 5 days to accompany each unit.

(b) Class III supply is based on the weight of POL required to operate ground and air vehicles a minimum of 5 days. Class III require-

ments for other equipment are established on a reasonable hourly operational basis for 5 days.

(c) Class V supply weights are based on the basic load, both ground and air.

Table 5-40. Consumption Rates—All Classes
(Lb/Per Man/Per Day)

1	Supply class	2	3
		USAREUR	Figure 5-2
2	I.....	6.27	7.31
3	II.....	7.04	3.26
4	III A.....	4.64	-----
5	III W.....	51.17	47.80
6	IV.....	4.06	6.80
7	V A.....	0.96	-----
8	V W.....	23.04	23.40
9	VI.....	4.50	2.59
10	VII A.....	0.16	3.51
11	VII B.....	0.82	
12	VII D.....	0.10	
13	VII G.....	0.25	
14	VII K.....	0.80	
15	VII L.....	0.40	
16	VII M.....	0.40	
17	VII N.....	0.04	0.14
18	VIII.....	0.30	
19	IX A.....	0.31	
20	IX B.....	0.31	1.52
21	IX D.....	0.16	
22	IX G.....	0.48	
23	IX K.....	1.55	
24	IX L.....	0.15	
25	IX M.....	0.25	
26	IX N.....	0.03	
27	IX T.....	0.03	-----
28	X.....	5.90	
29	Total.....	114.12	96.33

Table 5-41. Sample Computation of Requirements

1	Supply class	2		3		4		5		6		7	
		TOE		Supplies		Total							
		STON	MTON	STON	MTON	STON	MTON	STON	MTON	STON	MTON	STON	MTON
2	I.....	-----	-----	5.8	12.2	5.8	12.2	-----	-----	-----	-----	-----	-----
3	II.....	11.1	20.5	19.4	54.4	30.6	74.9	-----	-----	-----	-----	-----	-----
4	III A.....	17.6	-----	4.3	6.6	21.9	6.6	-----	-----	-----	-----	-----	-----
5	III W.....	6.2	-----	47.0	76.5	53.2	76.5	-----	-----	-----	-----	-----	-----
6	IV.....	1.0	1.5	11.2	16.8	12.2	18.3	-----	-----	-----	-----	-----	-----
7	V.....	-----	-----	23.9	21.5	23.9	21.5	-----	-----	-----	-----	-----	-----
8	VI.....	-----	-----	12.4	21.1	12.4	21.1	-----	-----	-----	-----	-----	-----
9	VII A.....	103.2	3,356.0 ^a	0.5	2.0	103.7	3,358.0	-----	-----	-----	-----	-----	-----
10	VII B.....	7.4	25.0	2.3	7.6	9.7	32.6	-----	-----	-----	-----	-----	-----
11	VII G.....	17.0	23.0	0.7	2.7	17.7	25.7	-----	-----	-----	-----	-----	-----
12	VII K.....	350.0	2,792.4	2.4	5.3	352.4	2,797.7	-----	-----	-----	-----	-----	-----
13	VII LM.....	7.8	43.0	2.2	4.0	10.0	47.0	-----	-----	-----	-----	-----	-----
14	VIII.....	-----	-----	0.9	2.3	0.9	2.3	-----	-----	-----	-----	-----	-----
15	IX.....	8.3	5.0	9.0	19.8	17.3	24.8	-----	-----	-----	-----	-----	-----
16	X.....	-----	-----	16.3	32.6	16.3	32.6	-----	-----	-----	-----	-----	-----
17	Pers.....	44.0	NA ^b	-----	-----	44.0	-----	-----	-----	-----	-----	-----	-----
18	Total.....	573.6	6,266.4	158.3	285.4	732.0	6,551.8	-----	-----	-----	-----	-----	-----

^a Reduced cube is given.

^b NA—seating capacity applies.

c. Table 5-42 shows consumption rates for class III supplies.

Table 5-42. Class III Consumption Rates

1	2	3
1	Product	Lb per man per day Gal per man per day
2	Army gnd bulk petrol fuels---	59.77 8.05
3	MOGAS-----	(38.19) (6.25) ^a
4	Diesel-----	(12.58) (1.80) ^{a b}
5	Eng oil-----	1.00 0.10 ^a
6	Gear lubs-----	0.80 0.80 ^a
7	Grease-----	0.06 ^c

^a Data based on SB 710-2, chap 2, sec I, for France and Germany.

^b Data on M60 tanks from consumption rates established during exercises in Europe.

^c Class III A supply requirements must be individually computed from fuel data for Army aircraft.

d. Class VI supplies:

(1) Table 5-43, column 2, is based on study estimates for a 150-day period. Figures do not include sundries pack issued with rations at 0.369 pounds per man per day. Table 5-43, columns 3 and 4, do not include items procured locally.

(2) Recreational and sports supplies (Table 5-43) do not include items procured locally or items procured from any source with non-appropriated funds as defined in AR 230-1.

e. Class IX supplies — Table 5-44 shows consumption rates for class IX supplies.

Table 5-43. Class VI Consumption Rates

1	2	3	4
1	Item	Lb per man per day	STON per 10,000 men per mo MTON per 10,000 men per mo
<i>Army Exchange Items</i>			
Combat zone			
2	Army in amph op-----	0.533	80.00 200.00
Theater:			
3	European-----	1.428	210.00 430.00
4	Pacific-----	1.571	240.00 500.00
<i>Special Services Items</i>			
Donated items:			
5	Total donated items-----		0.15 0.50
Recreational:			
6	Books and magazines-----		0.75 1.00
7	Music, theatrical, crafts, and misc-----		1.00 2.00
8	Sports-----		0.75 2.00
9	Total recreational-----		2.50 5.00

Table 5-44. Class IX Consumption Rates

1	2	3
1	Item	STON per 25,000 men per mo MTON per 25,000 men per mo
2	Motion picture service supplies-----	0.152 0.247

Section VII. STORAGE

5-27. Definition of Terms

An understanding of the following terms is necessary to use the data in this section in determining storage area requirement. (See AR 310-25 and the TM 743-200-series.)

a. *Storage space* — Any space, without regard to type of construction or improvement, used for storage.

b. *Storage building* — Any building constructed or acquired for the storage of supplies, even though some part of it has been diverted to and is used for officers, depot utility storage, or repair shops. Depot utility storage buildings, except when they are used in whole or in part for the

storage of supplies, are not considered storage buildings. The actual area used for storage purposes within such a building is considered storage space for reporting purposes.

(1) *Warehouse space* — Area in a building designed for storage purposes and constructed with roof and complete side and end walls.

(2) *Heated space* — Area in which the temperature may be controlled by the application of heat within specified limits.

(3) *Unheated space* — Area not equipped with heating facilities.

(4) *Humidity-controlled space* — Warehouse area equipped with humidity-control equipment.

(5) *Flammable space* — Warehouse area designed for the storage of highly flammable material.

(6) *Shed space* — Space in a covered structure having one or more sides or ends open or both. Does not include covered X-sites, Y-sites, or transitory-type shelters.

(7) *Other space* — Space being used for storage in any structure designed for other than storage purposes (e.g., barracks, dry tanks, hangars, transitory shelters, and Quonset buildings). Covered X-sites and Y-sites, hutments, and temporary canvas shelters are included when used for storage.

c. *Gross space* — Inside area between exterior walls without deductions for firewalls and other structural losses. Overall measurements of open storage area with no deductions for trackage and permanent roads in the area.

d. *Bin storage* — Storage of unpackaged parts, subassemblies, assemblies, or end items in bins so that an item may be withdrawn without breaking open a package containing a number of such items.

e. *Aisle in storage space* — Any passage within a storage area.

f. *Receiving and shipping space* — Gross space designated as work area for receipt and shipment of supplies and equipment.

g. *Nonstorage space* — That area within gross space that is not used for storage because of structural losses or designation for other than storage purposes. Includes transit shed space when used or reserved for that purpose.

h. *Net storage space* — The floor area on which bins are erected plus the floor area on which material can be stored.

i. *Open storage space* — Ground area designated for storage.

j. *Open improved storage space* — Open area that has been graded and hard surfaced or prepared with topping of some suitable material to permit effective materials-handling operations.

k. *Open unimproved storage space* — Open area that has not been surfaced for storage purposes.

l. *Open unimproved wet space* — That water area specifically allotted to and usable for the storage of floating equipment.

m. *Magazine area* — The area in a covered structure, above or below ground, constructed for the storage of ammunition and explosives.

n. *Tank storage space* — Space in tanks designated for the storage of supplies other than petroleum products.

o. *Ammunition and toxic materiel open space* — Area especially prepared for storage of explosive ammunition and toxic materiel. For reporting purposes, it does not include the surrounding area restricted for storage because of safety distance factors. It includes barricades and improvised coverings.

p. *Cold storage warehouse* — Space in which a controlled temperature below 50° F may be maintained.

(1) *Chill space* — Refrigerated warehouse space in which the temperature can be controlled between 32° F and 50° F.

(2) *Freeze space* — Refrigerated warehouse area in which the temperature can be controlled below a level of 32° F.

q. *Allocated space* — That area designated by higher authority representing the gross area formally apportioned for use.

r. *Dispersed storage area* — That portion of a depot or subinstallation that is geographically located away from the main establishment, but not at another reporting installation.

s. *Site area* —

(1) In covered storage the total land area required for buildings, spaced at minimum distances, plus all the necessary operating areas, such as access roads, depot roads, railway sidings, and truck parks.

(2) In open storage the total land surface required for net usable general storage area as defined above plus that additional area required to fulfill safety regulations and to operate properly the storage facility as a whole.

t. *Vertical space occupancy effectiveness* — A factor obtained by dividing actual by potential storage height for a specific supply category.

Table 5-45. Theater Tonnage and Space Requirements

Table 5-45: Theater Portage and Space Requirements										
	1	2	3	4	5	6	7	8	9	10
1	Cl	Consumed per man in thtr (Army plus AF) (STON per man per mo)	Percentage of STON of sup stored		STON per man per mo of sup stored		Sq m per STON		Required space per man per mo of sup (sq m)	
			Covered	Open	Covered	Open	Covered	Open	Covered	Open
2	I	0.1065	60	40	0.0639	0.0426	1.39	1.86	.0890	.0792
3	All other	0.2316	50	50	0.1158	0.1158	.93	1.49	.1076	.1719
4	III	0.9195	(Tk farm)							
5	V W	0.4074	10	90	0.0407	0.3667	1.39	1.86	.0568	.0681
6	V A	0.0549	(Air dep)							

5-28. Storage Factors

a. Table 5-45 gives optimum storage tonnage area requirements for support of military operations. These data are for general planning purposes only and may vary substantially as a result of climatic conditions or the tactical situation. For detailed data on storage planning, see the TM 743-200-series.

b. For classified data pertaining to storage of hazardous materials, see FM 101-10-3.

c. Table 5-46 gives factors for storage of maps. For plastic relief maps, consult experience factors or the Army Map Service.

Table 5-46. Storage of Maps

1	2	3
Item	Avg wt (lb)	Avg cum (for storage)
2 Bundle, 500 map sheets ----	60	.057
3 Crate, 1,000 map sheets ----	150	.142

5-29. Average Stack Heights

Figures in *a* and *b* below are for use in theaters. For CONUS storage, increase by 25 percent.

a. Covered Storage. All Services, 8 feet.

b. Open Storage. All Services, 6 feet.

5-30. Gross Space and Site Area Factors

The factors in table 5-47 provide requirements for gross space (as defined in paragraph 5-27c) and site area square footage, i.e., by multiplying requirements in table 5-45, columns 9 and 10, by each factor in turn.

Table 5-47. Gross Space and Site Area Factors

1	Cl of sup	2	3	4	5
		Gross space factors ^a		Site area factors ^b	
		Covered	Open	Covered	Open
2	I -----	1.40	1.50	2.00	1.50
3	All other -----	1.66	1.75	2.27	2.00
4	III ^c -----	1.25	1.30	1.80	1.43
5	V -----	1.25	1.25	112.00 ^d	(^e)

^a Apply additional factor of 3 for storage in the combat zone.

^b Apply additional factor of 5 for storage of class I, II, III, IV, and VII in the combat zone.

^c Excludes bulk storage of petroleum in tanks.

^d These factors consider the dispersion necessary as a safety precaution in storing ammunition.

^e See paragraph 5-29.

5-31. Operating Personnel Required for All Storage in a Theater

Figure 5-12 may be used to determine personnel requirements for all storage operations in a theater. Prisoners of war and civilians may be included as available.

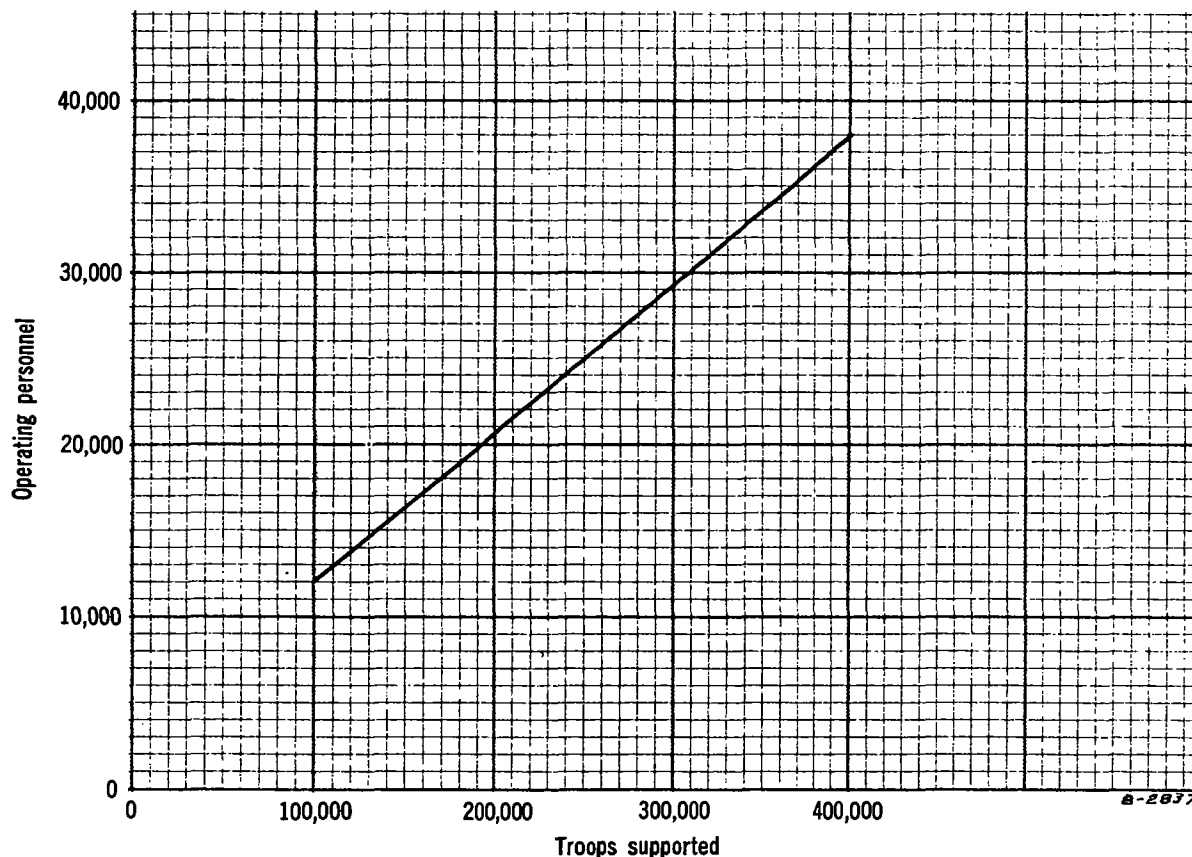


Figure 5-12. Requirements for storage personnel.

5-32. Miscellaneous Storage Requirements¹

Ammunition storage per kilometer of road ²	621 STON
Ammunition storage per square kilometer ²	1,931 STON
Minimum hardstand requirements for 2,500 vehicles ³	110,000 sq ft
Solid footing for vehicle park for 2,500 vehicles	4,000,000 sq ft
Minimum hardstand requirement for artillery and combat vehicles, per item	350 sq ft

5-33. Handling of Supplies

a. Labor Requirements.

(1) *Hand operations.* For long-term planning, labor requirements for handling supplies by hand are computed on the average of $\frac{1}{2}$ ton per man per hour for 10 hours each day. For short periods the average is much higher.

(2) *Mechanical handling.* For planning, the labor requirements for handling supplies by mechanical equipment, such as forklift trucks and

¹ Reference: TM 9-1300-206 (overseas only).

² Refers to temporary storage of ammunition along roadways and in urban fields and forest, such as may be found in combat zones.

³ Data based on the assumption that hardstand area will not be required for the total number of vehicles at any one time.

tractor-trailer trains, normally are limited to a working foreman and equipment operators to operate the mechanical equipment necessary to handle these supplies efficiently.

b. Handling Crews.

(1) *Hand operations.* The number of men who may be employed advantageously in loading or unloading one freight car is nine (one working foreman and eight laborers). The maximum crew for loading or unloading average loads by hand on Army trucks is five (one working foreman and four laborers).

(2) *Mechanical handling of palletized loads.* The number of men who may be advantageously employed in loading or unloading one freight car or truck of palletized supplies using mechanical-handling equipment is three (one working foreman and two materials handling equipment operators).

c. *Time Estimate (Based on Manual Handling).* The time estimate for average packaged or bundled military loads at depots, supply points, or using units, under average conditions, with a five-man crew for each truck or trailer and the number of trucks or trailers to be loaded or un-

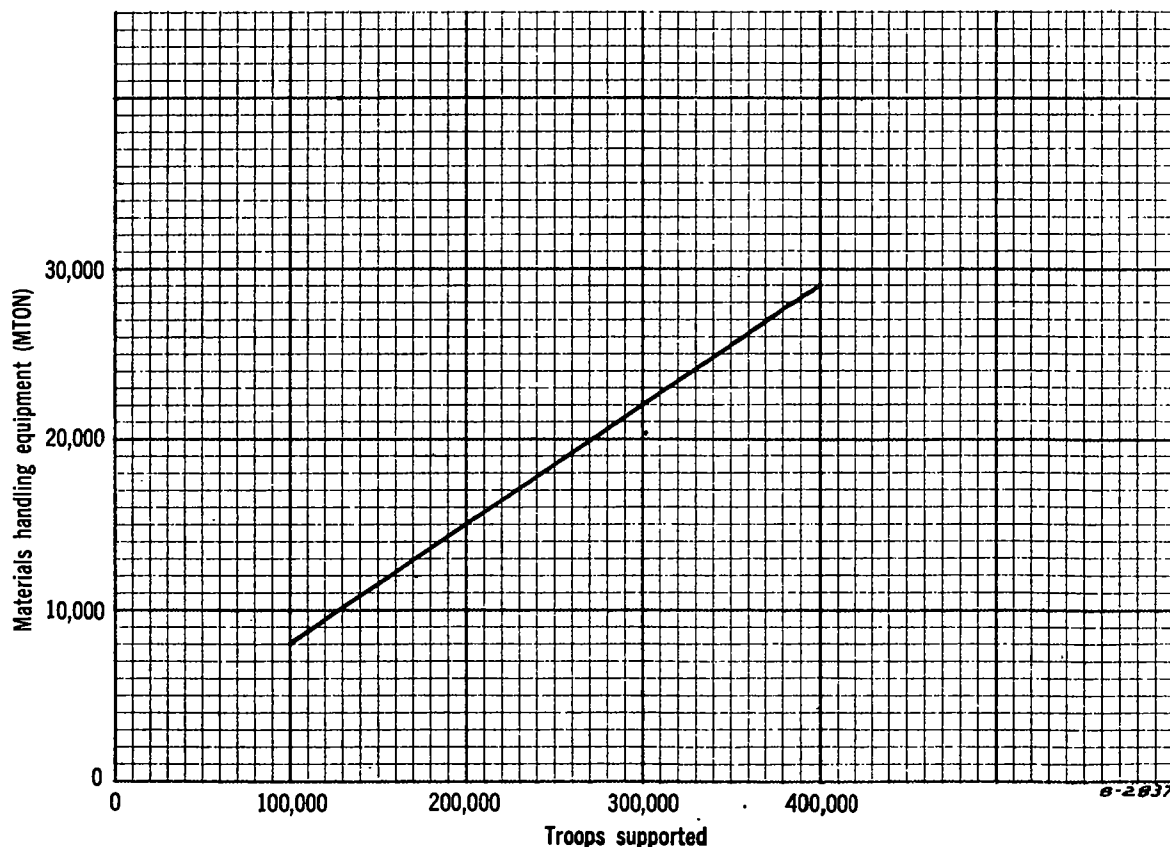


Figure 5-18. Requirements for materials handling equipment.

loaded simultaneously dependent on amount of labor available, is as follows:

<i>Loading and unloading</i>	<i>2½-ton truck</i>	<i>1½-ton trailer</i>
Average time.....	50 min	20 min
Minimum time.....	30 min	12 min

5-34. Materials Handling Equipment Requirements

A depot supplying 100,000 men will require about 7,700 MTON of materials handling equipment, including conveyors, pallets, scales, tractors, trailers, forklift trucks, handtrucks, lumber-straddle trucks, and stock-picker trucks (fig. 5-13).

5-35. Illustrative Problems

a. Situation, Problem A. To determine storage requirements for a theater of operations requiring 100,000 MTON of class I supplies.

b. Solution, Problem A. Storage area requirements:

An MTON = 40 cu ft.

Therefore, $100,000 \text{ MTON} \times 40 = 4,000,000$ cu ft of supplies to be stored.

Minimum percentage of covered storage required is 60 percent (table 5-45).

Therefore, 40-percent open storage required.

$0.60 \times 4,000,000 \text{ cu ft} = 2,400,000 \text{ cu ft}$ of supplies requiring covered storage.

$0.40 \times 4,000,000 \text{ cu ft} = 1,600,000 \text{ cu ft}$ of supplies to be stored in the open.

Average stack heights (para 5-29):

Covered storage = 8 feet.

Open storage = 6 feet.

$2,400,000 \text{ cu ft} \div 8 \text{ ft} = 300,000\text{-sq ft}$ net usable area of covered storage required.

$1,600,000 \text{ cu ft} \div 6 \text{ ft} = 267,000\text{-sq ft}$ net usable area of open storage required.

Gross space for each type of storage is based on net usable general storage area. Factors for computations, as found in table 5-47, are —

Covered storage = 1.4

Open storage = 1.5

(Assume storage is to be in the COMMZ; hence, additional combat zone factor of 3 is not required.)

$300,000 \text{ sq ft} \times 1.4 = 420,000\text{-sq ft}$ gross space required for covered storage.

$267,000 \text{ sq ft} \times 1.5 = 40,500\text{-sq ft}$ gross space required for open storage.

Site areas for each type of storage are based on gross. Table 5-47 contains factors for computations.

Covered storage = 2.0.

Open storage = 1.5.

(Assume storage is to be in the COMMZ; hence, additional combat zone factor of 5 is not required.)

$420,000 \text{ sq ft} \times 2.0 = 840,000\text{-sq ft}$ site area required for covered storage.

$40,500 \text{ sq ft} \times 1.5 = 60,750\text{-sq ft}$ site area required for open storage.

Total site area required:

Covered storage = 840,000 sq ft

Open storage = 60,750 sq ft

1,440,750 sq ft

$1,440,750 \text{ sq ft} \div 43,560 \text{ sq ft (1 acre)} = 30.7$ or 31 acres of site area required.

c. Situation, Problem B. To determine operating personnel and materials handling equipment requirements for all storage in a theater that has a strength of 250,000 men.

d. Solution, Problem B.

(1) *Part I, operating personnel requirements.* On the horizontal scale of figure 5-12 (para 5-31) locate the vertical line representing 250,000 men. This line crosses the oblique graph line at the horizontal line representing 24,500 operating personnel, as indicated on the left margin. Therefore, for general planning purposes, 24,500 men are needed to operate theater depots.

(2) *Part II, materials handling equipment requirements.* Using the same theater strength of 250,000 men, figure 5-13 shows that 18,500 MTON of materials handling equipment will be required.

5-36. Characteristics of Materials Handling Equipment

Table 5-48 lists materials handling equipment and certain characteristics, to include load and lift capacities. (See also table 5-29.)

Table 5-48. Characteristics of Materials Handling Equipment

Table 3-40. Characteristics of Tractor and Loading Equipment											
1	2	3	4	5	6	7	8	9	10	11	12
Item and line item number	Dimensions			Weight (STON)		Displacement (cu ft)	Capacity		Types of tires (S—solid rubber) (P—pneumatic)	Method of operation	Primary use
	Length (ft)	Width (ft)	Height (ft) (min)	Operating	Shipping		Load (lb)	Height of lift			
Trk, lift, fork:											Useful in moving and stacking palletized loads.
2	X49188	5.79	2.67	7.04	2.00	109	2,000	8 ft 4 in	S	Elec	
3	X50284						4,000	10 ft 7 in	S	Elec	
4	X50421	6.79	3.50	7.58		3.85	4,000	12 ft 0 in	S	Elec	
5	X50969	8.42	3.50	9.67		4.47	6,000	14 ft 0 in	S	Elec	
6	X51106	5.75	3.67	7.00	2.24	148	2,000	10 ft 7 in		Gas	
7	X51243						2,000	9 ft 4 in	S	Gas	
8	X51380	10.08	6.52	8.46		3.25	4,000	12 ft 0 in	P	Gas	
9	X51654	7.17	3.83	7.17		3.90	4,000	15 ft 0 in	S	Gas	
10	X51791	9.71	5.63	9.50		5.40	6,000	14 ft 0 in	P	Gas	
11	X52202	10.33	3.50	8.67		4.00	6,000	10 ft 7 in	S	Gas	
12	X52339	8.75	4.17	10.00		5.35	6,000	14 ft 0 in	S	Gas	
13	X52613	11.92	4.42	5.65		6.60	10,000	8 ft 4 in	S	Gas	
14	X52750	12.33	7.17	12.50		8.20	15,000	17 ft 6 in	P	Gas	
Trk, lift, fork, rough terrain:											Transfer of cargo on unimproved surfaces; most common usage, beach operations.
15	X51928	15.13	7.17	7.50		13.50	6,000	12 ft 0 in	P	Gas	
16	X52476	16.94	8.58	8.33		15.00	10,000	12 ft 0 in	P	Gas	
Trk, platform, util, ½-ton, 4 x 4, with equip:											Primarily for transporting unit loads short distances. May be used for stacking. Less expensive than fork-lift trucks, but less maneuverable.
17	X55627	9.83	4.16	4.08		86	10,000	0 ft 4 in		Elec	
Trac, wheeled, whs:							Drawbar pull (lb)				Used for towing one or more trailers. The tractor is small and maneuverable and should be used for moving when distance exceeds 250 feet.
18	W89009	6.17	3.46	5.67		1.35	2,000		S	Elec	
19	W89283	7.17	3.54	5.13		1.77	4,000		S	Elec	
20	W89557	9.83	5.67	5.58		2.50	4,000		P	Gas	
21	W89594	9.92	5.83	4.75		4.98	7,500		P	Gas	
Crane, trk, whs:							Load (lb)				Handles loads of shapes and sizes that are difficult to move with other equipment.

Table 5-48—Continued

1		2	3	4	5	6	7	8	9	10	11	12
1	Item and line item number	Dimensions			Weight (STON)		Displace- ment (cu ft)	Capacity		Types of tires (S—solid rubber) (P—pneu- matic)	Method of operation	Primary use
		Length (ft)	Width (ft)	Height (ft) (min)	Operating	Shipping		Load (lb)	Height of lift			
22	F38967-----	11.60	5.38	6.04	-----	6.00	377	6,000		S	Elec	Used extensively for moving lumber, poles, pipe, rods, and girders.
23	F39104-----	13.08	8.00	6.42	-----	10.35	672	10,000		P	Gas	
	Trk, straddle-carry:											
24	X56997-----	16.00	8.00	13.54	-----	8.25	1733	30,000		P	Gas	

Section VIII. DISTRIBUTION

5-37. Normal Order and Shipping Times

Table 5-49 illustrates the time to process normal bulk shipment of supplies. Times shown are for illustrative purposes only and represent an average of the probable maximum time intervals for processing a wide variety of items under varying conditions. Such intervals will increase or decrease depending on the length and complexity of the requisition, the class of supply, the distance of the theater from the CONUS, the availability of transportation, the type of transportation and handling facilities employed, and the workload on the various installations.

5-38. Army Repair Parts Supply System

The Army supply system is based on selective stockage, single-line-item requisitions, and electronic transmission and processing of supply data. Requisitions are processed through the field army support command (FASCOM) and the theater army support command (TASCOM) to CONUS supply sources by means of high-speed data transmission equipment (transceivers). When coupled with centralized stock control, high-speed data processing equipment, and direct delivery of theater nonstocked items to forward supply points, the system offers substantial reduction in order and shipping times are anticipated.

5-39. Buildup of Supply Levels

a. For estimation of requirements when it is desired to build up a certain level of supplies by a given date, at the same time adequately supplying present and future contemplated operations during the buildup period, the following formula is useful:

$$S = C \left(1 + \frac{L}{T} + W \right), \text{ when —}$$

S = shipping requirements during the buildup phase, expressed in pounds per day.

C = consumption (average) in pounds per day.

L = the supply level to be attained, expressed in days of supply.

T = time length of buildup phase in days. (Given any four of the factors, the fifth can be determined by transposing.)

W = wastage factor (percentage of total consumption expressed as a decimal). This factor is based on experience in the particular theater and normally ranges from 0 to 0.25.

b. Since the formula in *a* above assumes a constant troop strength, a chart similar to figure 5-14 may be used to show the relationship between changes in troop strength, the cumulative consumption, and the cumulative receipts in the establishment of a specified level of supply during a given buildup period.

5-40. Lines of Communications Buildup Capacity*a. General.*

(1) The chart in figure 5-15 indicates the maximum cumulative strength that can be built up in the shortest time, using lines of communications of fixed capacity, if these lines of communications also carry replenishment loads for personnel previously transmitted.

(2) The chart is applicable to situations in which maintenance loads are directly proportional to loads previously carried (initial loads) and has been prepared for the values 2, 4, 6, and 10 of R (ratio of initial to maintenance loads). More lines can be added readily to the chart for additional values of R .

(3) For each value of R , two lines are shown on the chart—one solid and one dashed. For each value of R , the use of solid or dashed line in computations depends on the assumption applicable to the situation.

(*a*) The solid-line curve in each case is based on the assumption that at any time T , the strength being served on a maintenance basis, is equal to the accumulation of strength previously served on an initial basis (i.e., maintenance begins immediately on arrival in the theater, and initial loads are not alternately depleted and replenished).

(*b*) The dashed-line curve in each case is based on the assumption that the increment of strength served on an initial basis in any 1 month will be served on a maintenance basis during the following month (i.e., initial loads would be depleted, on the average, by about 15 days' maintenance supply before replenishment would begin).

b. Construction of Curves for Additional Values of R . To construct curves for values of R other than those shown, proceed as follows:

(1) For solid lines (see assumption in *a*(3) above), draw a straight line through the origin (0, 0) and the point on scale R representing the value of R (ratio of initial to maintenance loads).

(2) For dashed lines (see assumption in *a*(3) above), draw a straight line through the

Table 5-49. Maximum Oversea Order and Shipping Time Allowance for Troop Support Requisitions

1	2	3	4	5	6	7	8	9	10	11	12	13	14
Area ^a Issue group Priority designators Emphasis required	A	B 1	C	A	B 2	C	A	B 3	C	A	B 4 ^b	C	
Cycle segments	Consecutive hours	1 through 3 7-day workweek, 24-hour workday—issue stocks to "0" balance		4 through 8 Calendar days			9 through 15 Calendar days	16 through 20 Regular workweek, regular-shift workday—issue to control level		Calendar days			Responsible agency
2 From transmittal of requisitions by oversea command to receipt by initial source of supply...	0	0	0	0	0	0	1	1	1	1	1	1	Oversea command.
3 From receipt of requisition by initial source of supply until supplies are released to carrier...	24	24	24	3	3	3	10	10	10	12	12	12	Initial source and shipping activities.
<i>Note.</i> This time is divided as follows:													
4 Stock control activity.....	(8)	(8)	(8)	(1)	(1)	(1)	(3)	(3)	(3)	(4)	(4)	(4)	Initial source.
5 Shipping activity.....	(16)	(16)	(16)	(2)	(2)	(2)	(7)	(7)	(7)	(8)	(8)	(8)	Shipping activity.
6 From date supplies are turned over to carrier until receipt at oversea terminal.....	88	88	88	8	8	8	28	28	28	37	37	52	Transportation agency.
<i>Note.</i> This time is divided as follows:													
7 Time depot to terminal.....	(24)	(24)	(24)	(2)	(2)	(2)	(5)	(5)	(5)	(9)	(9)	(9)	
8 Time in terminal.....	(12)	(12)	(12)	(2)	(2)	(2)	(5)	(5)	(5)	(10)	(10)	(10)	
9 Time in transit (air or sea).....	(52)	(52)	(52)	(4)	(4)	(4)	(18)	(18)	(18)	(18)	(18)	(33)	
10 From receipt at oversea terminal to recorded receipt by requisitioner.....	56	56	56	4	4	4	11	6	6	15	10	10	Oversea command.
<i>Note.</i> This time is divided as follows:													
11 Time in discharge.....	(24)	(24)	(24)	(2)	(2)	(2)	(3)	(3)	(3)	(7)	(7)	(7)	
12 Terminal intratheater movement and recording in requisitioner's records.....	(32)	(32)	(32)	(2)	(2)	(2)	(8)	(3)	(3)	(8)	(3)	(3)	
13 Total.....	168	168	168	15	15	15	50	45	45	65	60	75	

^a Area A—Europe; area B—Alaska, Bermuda, Caribbean, Hawaii, and South America; area C—all other oversea areas.

^b See AR 725-50 for instructions on the assignment of required delivery date beyond the normal order and shipping time for issue group 4.

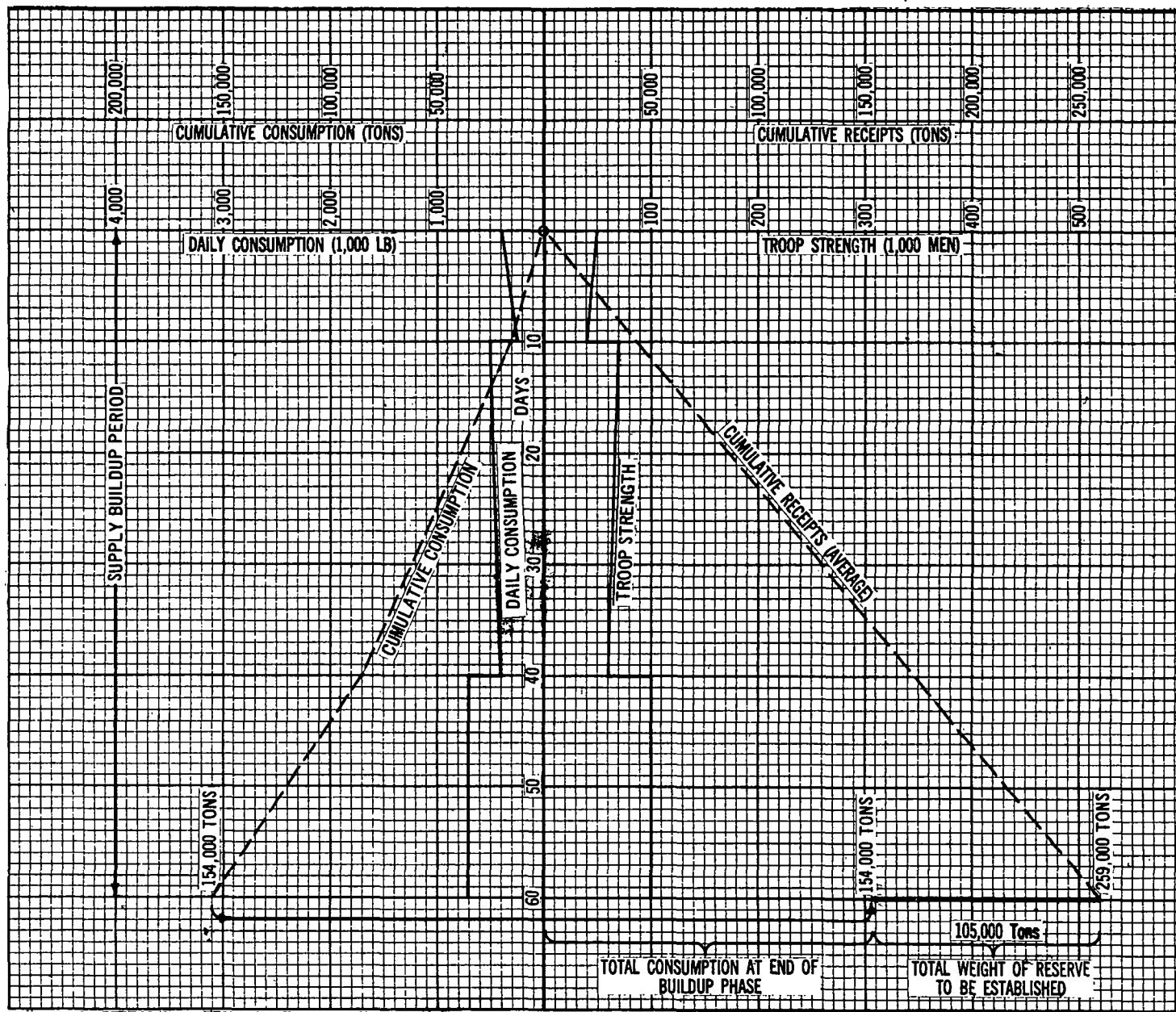


Figure 5-14. Supply level relationships.

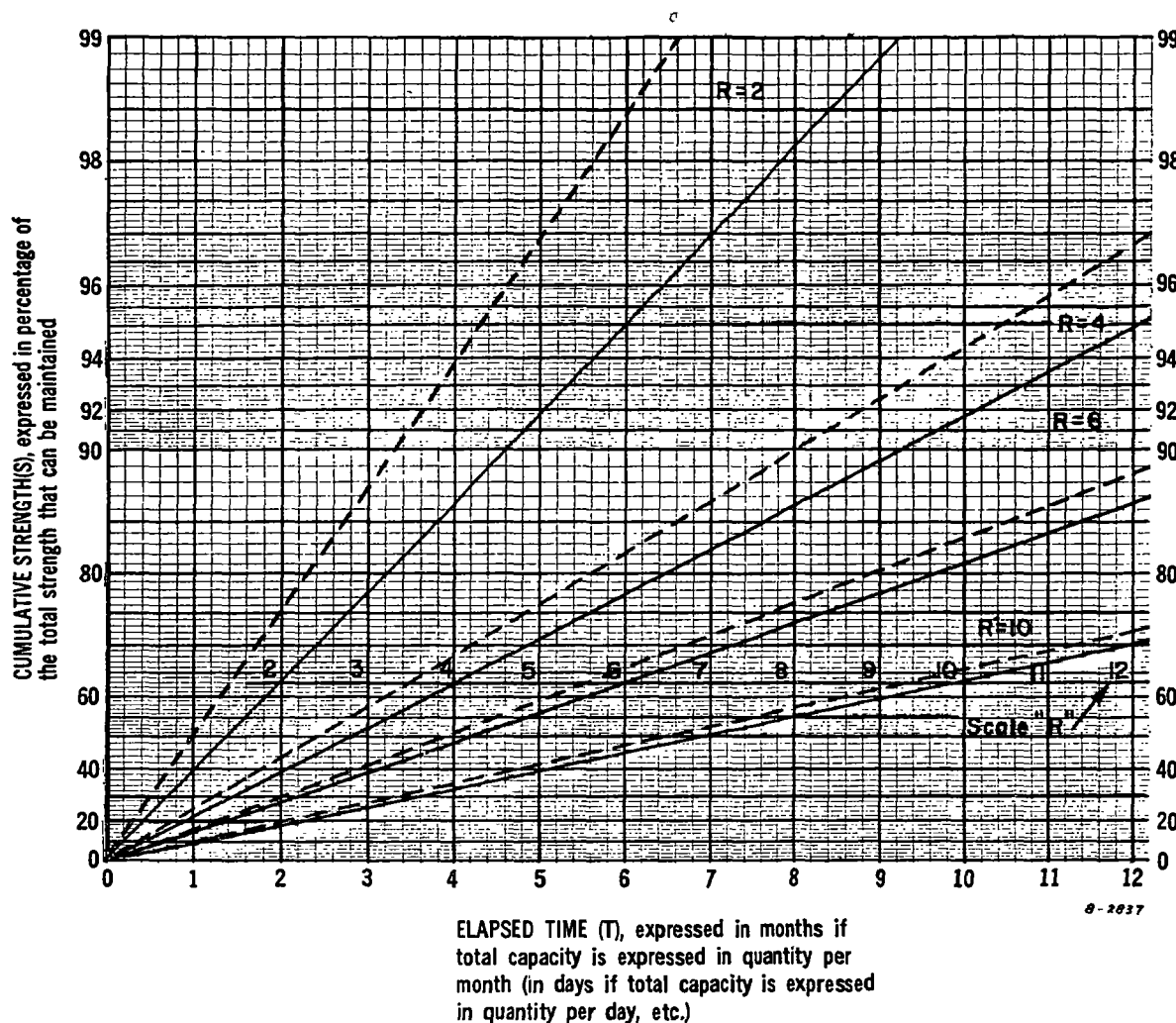


Figure 5-15. Lines of communications capacity.

origin (0, 0) and the point on scale R that is less by 0.5 than the value of R .

c. Examples of Use of Chart. The chart in figure 5-15 may be used in calculations relating to a movement of troops or supplies through a terminal or, analogously, to their movement over any available lines of communications, e.g., a railroad, a highway, an air transport route. It can be used to determine the time it would take to reach various strengths, the strength that can be accumulated in any amount of time, and the necessary shiploads of initial or maintenance supplies. The ratio R may be based on space requirements; number of cars, ships, tonnages; number of individuals; etc.

(1) *Example 1.*

(a) *Problem.* The capacity of a port = 300,000 MTON per month. Initial equipment for troops moving through the port = 4.8 MTON per man; supplies for maintenance of troops moved through the port = 0.8 MTON per man per

month. What strength can be built up through this port in 7 months if maintenance supply for the troops begins immediately with their arrival in the theater?

b. Solution.

1. $R = \text{initial} + \text{maintenance load} = 4.8 \div 0.8 = 6$.

2. $T = \text{time elapsed} = 7 \text{ months}$.

3. From the chart, locate $T = 7$ on the horizontal scale; continuing vertically upward to the intersection of $T = 7$ with the solid line for $R = 6$, read "Cumulative Strength (S)" from the vertical scale = 69 percent of the total strength that can be maintained.

4. Total strength that can be maintained = $300,000 \div 0.8 = 275,000$ troops.

5. Therefore, cumulative strength after 7 months = 69 percent of 375,000 = 259,000 troops.

(2) *Example 2.*

(a) *Problem.* Assuming the same circumstances as in (1) (a) above, how many new troops

will be moved through the port during the 7th month?

(b) *Solution.*

1. Proceed as in (1)(b) above, determine the cumulative strength after 6 months = 64 percent of the total strength that can be maintained.

2. From the solution in (1)(b) above and the foregoing, the observation is that from the end of the 6th to the end of the 7th month (i.e., during the 7th month) the cumulative strength changed from 64 percent to 69 percent of the total strength that could be maintained.

3. Therefore, the new troops moved in during the 7th month represent 69 percent less 64 percent = 5 percent of the total strength that can be maintained = 5 percent of 375,000 = 18,750 troops.

(3) *Example 3.*

(a) *Problem.* Assuming the same circumstances as in (1)(a) above, except that the maintenance factor of 0.8 MTON per man per month is so established that maintenance can start during the following month for all troops moved initially during any 1 month, what could be the strength built up after 7 months?

(b) *Solution.*

1. Proceed as in (1)(b) above, except that in using the chart, use the *dashed* line for $R = 6$ rather than the solid line.

2. Read cumulative strength = 72 per-

cent of the total strength that can be maintained.

3. Cumulative strength after 7 months = 72 percent of 375,000 = 270,000 troops.

(4) *Example 4.*

(a) *Problem.* Initial and maintenance supplies for service forces are to be moved over a highway, the capacity of which is 10,000 STON per month. Initial equipment for these forces averages 3,350 pounds per man; maintenance averages 430 pounds per man per month. When will the size of the service force have been built up to 60 percent of its ultimate strength if maintenance supply must begin immediately on arrival of the forces in the theater?

(b) *Solution.*

1. $S = 60$ percent of the maximum that can be supported.

2. $R = 3,350 \div 430 = 7.8$.

3. Because no line for $R = 7.8$ appears on the chart, it must be constructed. Observing the assumption in the problem above as to initiation of maintenance, draw a solid line through (0, 0) and the point 7.8 on scale R (in accordance with directions above).

4. Using the constructed line, as indicated in previous examples, determine for $S = 60$ percent that $T = 7$ months.

5-41. DS/GS Supply Units

Table 5-50 lists those supply and service units performing DS and GS functions.

Table 5-50. DS/GS Supply Units

1	2
GS	DS
1. The general supply GS company (TOE 29-118) establishes and operates a general supply facility for the receipt, storage, and issue of general supplies. When employed in the army service area, it maintains a portion of the field army reserve stocks. It can handle daily approximately 800 short tons of supplies of which approximately 80 percent is handled mechanically and 20 percent is handled manually. The 800 short tons include a factor of 2.5 for receiving, intrastorage handling, and issue. It maintains an ASL of 12,500 line items. 2. The heavy material supply GS company (TOE 29-127) receives, stores, and issues all types of self-propelled and towed equipment to divisions and nondivisional DS units; receives, stores, and issues fortification and construction supplies and bridging equipment; and combat loads equipment prior to issue, maintains a stock of approximately 2,200 line items that constitutes the ASL. 3. The repair parts supply company, GS (TOE 29-119), provides wholesale repair parts for all items, except cryptographic and topographic materials, item peculiar to missile systems, medical items, and class V supplies. Repair parts companies operating in the army service area do not provide repair parts for aircraft and aircraft armament subsystem items. The company stocks about 40,000 to 45,000 line items, stores up to 15 days supply of repair parts, excluding parts for aircraft armament subsystems. The company is capable of providing supply for the equivalent of two to four DS maintenance battalions and two GS maintenance battalions. 4. The aircraft and missile repair parts supply company, GS (TOE 29-129), provides repair parts support for Army aircraft, Army aircraft armament subsystems, and avionics. The company also provides class II and IX missile peculiar repair parts support (less repair parts peculiar to special ammunition) to DSU's and GS units. The estimated total number of repair parts necessary to support the missile systems is 55,000 line items. 5. The QM petroleum supply company (TOE 10-477) provides and operates petroleum storage facilities for the wholesale transfer operations to division support commands and DS petroleum supply platoons of the supply and service companies. The company lays, operates, and retrieves petroleum hoses, as required, and maintains a prescribed portion of the field army bulk stocks. 6. The field service company, GS, army (TOE 29-124), provides field service that includes laundry, light-weight textile renovation, graves registration services, decontamination service, and a pool of general duty (labor) personnel. This unit is distinguished from the forward company (adjacent column) in that it has no bakery mission, but does operate a temporary military cemetery.	1. The supply and service company, DS (TOE 29-147), provides DS supplies and services to nondivisional troops. It is assigned in FASCOM to support brigades and normally is attached to HHC, supply and service battalion, on the basis of one per 15,000 nondivisional troops supported. 2. The general supply GS company, the heavy material supply GS company, and the petroleum supply company are also located in the corps areas to operate supply points, as required. 3. Repair parts supply companies operating in the corps area provide repair parts for aircraft and aircraft armament subsystem items. a. When employed in the corps area, the company stocks about 35,000 line items of repair parts. b. In the corps area the company stores up to 15 days supply of selected fast-moving repair parts. 4. The field service GS company, forward (TOE 29-114), provides field services that include laundry, light-weight textile renovation, graves registration services, decontamination service, fresh baked bread, salvage, and a pool of general duty (labor) personnel. a. Provides, when operating on two 10-hour shifts per day, bulk laundry and clothing exchange service in support of approximately 13,650 divisional troops, or provides emergency clothing impregnation service. b. Performs limited chemical, biological, and radiological decontamination of critical installations, terrain, and material in support of 16,000 troops, using decontaminants listed in TM 3-320; operates emergency personnel decontamination station with a capacity of 480 individuals per hour; and/or, as required, is adaptable for emergency firefighting and mobile shower service. Individual section capabilities are as listed in FM 3-85. c. When operating on two 10-hour shifts per day, bakes and provides fresh bread for approximately 15,000 divisional troops based on a normal bread ration of 0.5 pound/per man per day. 5. DS ASL of missile system peculiar repair parts are stocked at DSU's organic to the firing battalions. These DSU support organizational PLL and their own DX operation.

CHAPTER 6

COMBAT SERVICE SUPPORT—TRANSPORTATION

Note. This chapter contains detailed unclassified data on transportation capabilities and methods of computing transportation requirements. The chapter presents a section on general transportation planning and a separate section on each of the major means of transportation required to support military operations by water, rail, highway, and air. FM 101-10-3 contains classified data pertaining to transportation.

Section I. PLANNING

6-1. Transportation Estimates and Plans

a. Transportation estimates and plans are necessarily dependent on the transportation user whose firm requirements are often not available until after tactical plans and supply service plans have been completed. For transportation planners to plan concurrently with other staff agencies, often they must adopt methods of using troop strength and requirement factors that permit a reasonable estimate of transportation requirements in broad terms, to be defined later in terms of class and service (or item) of supplies and categories of personnel or troop units.

b. Transportation planning embraces the following:

(1) Surveying existing and potential facilities for movement of troops and supplies.

(2) Selecting the available means of movement that provide the greatest flexibility, based on a study of existing and potential facilities.

(3) Planning for the maximum use of carrying capacity.

(4) Insuring that the transportation plan provides for flexibility.

6-2. Capabilities of Lines of Communications

a. The capabilities of lines of communications are quantitative statements of the ability of the lines to transport cargo or troops and usually are expressed in tons (long tons (LTON) or short tons (STON)) or troops per day. Frequently, troops per day may be equated to tons per day to provide a common unit of measure. A ton-kilometer is the actual movement of 1 ton 1 kilometer.

b. Transportation capabilities are dependent on the following:

(1) Number, lift capacities, and speed of available transportation mediums.

(2) Environmental factors (terrain, climate, etc.) influencing the operational characteristics of the transport vehicles.

(3) Distances between origins and destinations.

(4) Loading and unloading capabilities.

(5) Maintenance capabilities.

(6) Turnaround time (time required for one vehicle to complete one cycle). This is dependent

on the above factors as well as on refueling time and other incidental time consumed in the normal operation of the mode.

(7) Critical density. This refers to the number of vehicles that will provide the maximum tonnage rate over a line of communications during a specified period, considering the above factors.

(8) Efficiency of management, operating, and maintenance personnel.

c. Efficiency of management is an intangible factor which may enter arithmetical calculations of capability only by experience or estimate. Such efficiency is dependent on the number and skill of operating personnel, degree of intelligent movement planning, and effectiveness of operating technique.

6-3. Advance Transportation Planning Factors

To obtain an estimate of transportation requirements well in advance of detailed planning, averages shown below and tables in this section may be used.

a. Water.

(1) *Boat operations.*

Light amphibian (LARC-5)

company capacity 1,080 STON per company
per day

Medium boat company capacity 720 STON per company
per day

Heavy boat company capacity 1,440 STON per company
per day

(2) *Water terminal and beach operations.*

Unless other factors govern to provide dispersion and to present less favorable targets to the enemy, plans should provide for the discharge of not less than 40 percent of tonnage over the beach and through shallow-draft facilities. As friendly capabilities decrease and as the destructive magnitude of enemy weapons increases, this over-the-shore proportion should be increased to reduce dependence on major water terminals to support military operations.

(3) *Percentage of organizations and supply moved in assault or cargo craft in amphibious operations.* Supply as used below refers to accompanying supply. After the assault phase, supply is accomplished by cargo shipping only, except for emergency supply. Percentages are as follows (to be used only when assault lift is not known):

(a) Eighty percent of the total personnel is moved in assault naval shipping.

(b) Twenty percent of the total personnel is moved in cargo-type shipping.

(c) Sixty percent of the organizational equipment and supplies for units moved in assault naval shipping accompanies the units transported in that shipping.

(d) Forty percent of the organizational equipment and supplies for units moved in assault naval shipping is transported in cargo-type shipping.

(e) Because of space or other factors, it is sometimes impossible to move all the organizational equipment and supplies of a unit on the same ship. These supplies and equipment, in such case, may be moved on another ship of the same convoy, provided sufficient personnel from the parent unit accompany them.

b. Railways (Foreign Countries).¹

(1) *Standard gage* (1.435 meters (56½ inch)).

Single track.....10 trains (4,000 STON) per day in each direction (supports six divisions)

Double track....30 trains (12,000 STON) per day in each direction (supports 18 divisions)

Trainload.....400 STON of cargo (20 cars at 20 tons each)
1,000 troops (40 boxcars at 25 troops each)

(2) *Narrow gage* (0.91 meter (36 inches), 1.00 meter (39¾ inches), and 1.067 meters (41 inches)).

Single track....10 trains (3,000 STON) per day in each direction

Trainload.....300 STON of cargo (20 cars at 15 tons each)
or 500 troops (20 boxcars at 25 troops each)

c. Highway (Supply Traffic in Combat Zone).

(1) Highway tonnage capability is as follows:^{2,3}

Dirt.....	1,600 STON per day forward
Gravel.....	3,400 STON per day forward
Bituminous-treated.....	5,800 STON per day forward
Bituminous.....	7,300 STON per day forward
Concrete.....	8,400 STON per day forward

¹ For planning, new carload capacity (payload) is computed at 50 percent of its rated capacity. U.S. equipment overseas box, gondolas, and flatcars, 40 tons rated capacity (standard gage); 30 tons rated capacity (narrow gage).

² No exact formula has been developed for determining the capabilities of various types of roads and highways because of various factors that must be considered. These capabilities are based on the following assumptions:

a. Operation is sustained.

b. Necessary road maintenance is performed.

c. Each road bears two lanes of traffic, permitting movement in both directions.

d. Standard cargo trucks, 2½-ton, 6x6, are used.

e. Two-thirds of the capability of the road is used for civil and military traffic normal to a theater of operations.

³ Reductions for width, alinement, and weather have not been applied (para 6-40).

(2) A hard-surface, two-lane road of high-type asphalt, macadam, or equivalent will support a corps of four or five divisions.

(3) 219 vehicles (less any available vehicles from the infantry division supply and transport battalion) are required to move the foot troop of an infantry division in one lift.

(4) A transportation light truck company (TOE 55-17), equipped with 2½-ton, 6 × 6 cargo trucks, with 45 available vehicles making four round trips per day, can transport in local hauls 720 STON of cargo (4 tons per truck) on highway, or 3,600 passengers (20 passengers per truck) on or off highway. In line hauls, with 45 trucks available making two⁴ round trips per day (one per 10-hour shift), the company can transport 360 STON of cargo (4 tons per truck) on highway, or 1,440 passengers (16 per truck) on or off highway. In one lift, off highway, with 45 trucks available, the company can transport 112.5 STON of cargo (2½ tons per truck).

(5) A transportation medium truck company (TOE 55-18), equipped with 5-ton, 6 × 6 cargo trucks and 12-ton trailers, can transport in long hauls 1,080 STON of cargo or 4,500 troops on or off highway. When equipped with 5,000 gallon tankers, long-haul capability is 450,000 gallons a day. In local hauls, capacity is doubled. In one lift, off highway, with 45 trucks available, the company can transport 225 STON of cargo (5 tons per truck).

d. Capacities of Transportation Mediums. Table 6-1 shows these capacities.

e. Transportation Requirements of the Infantry Division. Table 6-2 shows these requirements.

f. Lift Requirements, Field Army Units in STON. Table 6-3 shows these requirements. Units comprise field army command and control units; major units of the three division bases; of the separate brigade bases; and of the maneuver battalions; as well as some selected units furnishing combat support and combat service support to the field army. The number of Air Force aircraft required to accomplish the lift is indicated. Derivation of these figures is explained in paragraph 6-41. Tonnages are derived from consumption rates computed in paragraph 5-26. Oversized equipment and or overweight equipment which may require special handling, is indicated in c, e, and g, table 6-3.

⁴ One round trip per day is more likely under conditions prevailing in Southeast Asia.

Table 6-1. Capacities of Transportation Medium

1	2	3	4	5
Medium		STON per day	LTON per day	Adequate to maintain—
Land:				
2 Highways (average).....	Gravel.....	3,200	-----	2 divisions.
3	Bituminous-treated.....	5,800	-----	Corps of 4 divisions.
4	Concrete.....	8,400	-----	Field army of 8-12 divisions.
5 Railways each way.....	Single-track.....	4,000	3,570	3 divisions.
6	Double-track.....	12,000	10,700	9 divisions.
7 Pipeline.....	4-in (inside diameter).....	910	810	3 divisions.
8	6-in.....	2,000	1,800	5-8 divisions.
9	8-in.....	3,480	3,100	1 typical field army.
10	12-in.....	18,300	16,430	5 typical field armies.
Water:				
11 Discharge rate.....	Average cargo ship.....	720	643	½ division.
12 Across beaches.....	Per 1,000 m of beach.....	1,860	1,650	1 division plus.
13 Capacities of average cargo ship.....		10,000 MTON or 5,000 LTON (5,600 STON) of Army cargo.*		
14 Capacities of average train in theater of operations.....		1,000 troops or 400 STON of cargo.		

*See paragraph 6-14.

Table 6-2. Transportation Requirements of the Infantry Division

1		2	
1	Type	Requirement	
2	Highway-----	5 trans light trk companies in addition to organic transport.	
3	Air-----	Approximately 781 C-130-type aircraft sorties and 374 C-124-type aircraft sorties are required to air-land an infantry division. This is a lift of approximately 18,000 tons. For detailed data, sec FM 61-100.	
4	Amphibious operation.....	Average strength of an <i>assault division</i> , including shore party and other attached and supporting elements, is 25,000 men with 5,000 vehicles. If 75 percent of the vehicles of the infantry division and attached and supporting elements are loaded out with the division in assault shipping, the requirements in assault shipping for a reinforced division in an amphibious operation are—	
	Type	Extended voyage (10 days)	Short voyage (2-3 days)
	APA (transport, attack)-----	6	3
	AKA (cargo ship, attack)-----	15	6
	LST (landing ship, tank)-----	26	45
	LSD (landing ship, dock)-----	7	16
	LPH (landing platform, helicopter)-----	4	4

Table 6-3. Lift Requirements—Field Army Units
a. Command and Control Units

1	2	3	4	5	6	7
Unit	TOE	Weight of pers equip and sup (STON)	Type of acft combination	Acft requirements		
				C-130	C-124	C-141
2 HHC, spt gp.....	29-102G	103.9	1	8	-----	-----
			2	-----	6	-----
			3	-----	-----	4
3 HHC, army.....	51-1T	230.7	1	16	-----	-----
			2	-----	11	-----
			3	-----	-----	9
4 HHC, corps.....	52-1T	72.7	1	6	-----	-----
			2	-----	5	-----
			3	-----	-----	4
5 HQ and sp trp, FASCOM.....	54-12T	129.1	1	9	1	-----
			2	-----	8	-----
			3	-----	1	6
6 HHC, spt bde, army.....	54-22T	72.3	1	6	-----	-----
			2	-----	5	-----
			3	-----	-----	4
7 HHC, spt bde, corps.....	54-22T	72.3	1	6	-----	-----
			2	-----	5	-----
			3	-----	-----	4

Table 6-3—Continued
b. Infantry Division Base

C-130, C-124, C-141, C-5A, C-17, C-172, C-173, C-174, C-175, C-176, C-177, C-178, C-179, C-180, C-181, C-182, C-183, C-184, C-185, C-186, C-187, C-188, C-189, C-190, C-191, C-192, C-193, C-194, C-195, C-196, C-197, C-198, C-199, C-200, C-201, C-202, C-203, C-204, C-205, C-206, C-207, C-208, C-209, C-210, C-211, C-212, C-213, C-214, C-215, C-216, C-217, C-218, C-219, C-220, C-221, C-222, C-223, C-224, C-225, C-226, C-227, C-228, C-229, C-230, C-231, C-232, C-233, C-234, C-235, C-236, C-237, C-238, C-239, C-240, C-241, C-242, C-243, C-244, C-245, C-246, C-247, C-248, C-249, C-250, C-251, C-252, C-253, C-254, C-255, C-256, C-257, C-258, C-259, C-260, C-261, C-262, C-263, C-264, C-265, C-266, C-267, C-268, C-269, C-270, C-271, C-272, C-273, C-274, C-275, C-276, C-277, C-278, C-279, C-280, C-281, C-282, C-283, C-284, C-285, C-286, C-287, C-288, C-289, C-290, C-291, C-292, C-293, C-294, C-295, C-296, C-297, C-298, C-299, C-300, C-301, C-302, C-303, C-304, C-305, C-306, C-307, C-308, C-309, C-310, C-311, C-312, C-313, C-314, C-315, C-316, C-317, C-318, C-319, C-320, C-321, C-322, C-323, C-324, C-325, C-326, C-327, C-328, C-329, C-330, C-331, C-332, C-333, C-334, C-335, C-336, C-337, C-338, C-339, C-340, C-341, C-342, C-343, C-344, C-345, C-346, C-347, C-348, C-349, C-350, C-351, C-352, C-353, C-354, C-355, C-356, C-357, C-358, C-359, C-360, C-361, C-362, C-363, C-364, C-365, C-366, C-367, C-368, C-369, C-370, C-371, C-372, C-373, C-374, C-375, C-376, C-377, C-378, C-379, C-380, C-381, C-382, C-383, C-384, C-385, C-386, C-387, C-388, C-389, C-390, C-391, C-392, C-393, C-394, C-395, C-396, C-397, C-398, C-399, C-400, C-401, C-402, C-403, C-404, C-405, C-406, C-407, C-408, C-409, C-410, C-411, C-412, C-413, C-414, C-415, C-416, C-417, C-418, C-419, C-420, C-421, C-422, C-423, C-424, C-425, C-426, C-427, C-428, C-429, C-430, C-431, C-432, C-433, C-434, C-435, C-436, C-437, C-438, C-439, C-440, C-441, C-442, C-443, C-444, C-445, C-446, C-447, C-448, C-449, C-450, C-451, C-452, C-453, C-454, C-455, C-456, C-457, C-458, C-459, C-460, C-461, C-462, C-463, C-464, C-465, C-466, C-467, C-468, C-469, C-470, C-471, C-472, C-473, C-474, C-475, C-476, C-477, C-478, C-479, C-480, C-481, C-482, C-483, C-484, C-485, C-486, C-487, C-488, C-489, C-490, C-491, C-492, C-493, C-494, C-495, C-496, C-497, C-498, C-499, C-500, C-501, C-502, C-503, C-504, C-505, C-506, C-507, C-508, C-509, C-510, C-511, C-512, C-513, C-514, C-515, C-516, C-517, C-518, C-519, C-520, C-521, C-522, C-523, C-524, C-525, C-526, C-527, C-528, C-529, C-530, C-531, C-532, C-533, C-534, C-535, C-536, C-537, C-538, C-539, C-540, C-541, C-542, C-543, C-544, C-545, C-546, C-547, C-548, C-549, C-550, C-551, C-552, C-553, C-554, C-555, C-556, C-557, C-558, C-559, C-560, C-561, C-562, C-563, C-564, C-565, C-566, C-567, C-568, C-569, C-570, C-571, C-572, C-573, C-574, C-575, C-576, C-577, C-578, C-579, C-580, C-581, C-582, C-583, C-584, C-585, C-586, C-587, C-588, C-589, C-590, C-591, C-592, C-593, C-594, C-595, C-596, C-597, C-598, C-599, C-600, C-601, C-602, C-603, C-604, C-605, C-606, C-607, C-608, C-609, C-610, C-611, C-612, C-613, C-614, C-615, C-616, C-617, C-618, C-619, C-620, C-621, C-622, C-623, C-624, C-625, C-626, C-627, C-628, C-629, C-630, C-631, C-632, C-633, C-634, C-635, C-636, C-637, C-638, C-639, C-640, C-641, C-642, C-643, C-644, C-645, C-646, C-647, C-648, C-649, C-650, C-651, C-652, C-653, C-654, C-655, C-656, C-657, C-658, C-659, C-660, C-661, C-662, C-663, C-664, C-665, C-666, C-667, C-668, C-669, C-670, C-671, C-672, C-673, C-674, C-675, C-676, C-677, C-678, C-679, C-680, C-681, C-682, C-683, C-684, C-685, C-686, C-687, C-688, C-689, C-690, C-691, C-692, C-693, C-694, C-695, C-696, C-697, C-698, C-699, C-700, C-701, C-702, C-703, C-704, C-705, C-706, C-707, C-708, C-709, C-710, C-711, C-712, C-713, C-714, C-715, C-716, C-717, C-718, C-719, C-720, C-721, C-722, C-723, C-724, C-725, C-726, C-727, C-728, C-729, C-730, C-731, C-732, C-733, C-734, C-735, C-736, C-737, C-738, C-739, C-740, C-741, C-742, C-743, C-744, C-745, C-746, C-747, C-748, C-749, C-750, C-751, C-752, C-753, C-754, C-755, C-756, C-757, C-758, C-759, C-760, C-761, C-762, C-763, C-764, C-765, C-766, C-767, C-768, C-769, C-770, C-771, C-772, C-773, C-774, C-775, C-776, C-777, C-778, C-779, C-780, C-781, C-782, C-783, C-784, C-785, C-786, C-787, C-788, C-789, C-790, C-791, C-792, C-793, C-794, C-795, C-796, C-797, C-798, C-799, C-800, C-801, C-802, C-803, C-804, C-805, C-806, C-807, C-808, C-809, C-810, C-811, C-812, C-813, C-814, C-815, C-816, C-817, C-818, C-819, C-820, C-821, C-822, C-823, C-824, C-825, C-826, C-827, C-828, C-829, C-830, C-831, C-832, C-833, C-834, C-835, C-836, C-837, C-838, C-839, C-840, C-841, C-842, C-843, C-844, C-845, C-846, C-847, C-848, C-849, C-850, C-851, C-852, C-853, C-854, C-855, C-856, C-857, C-858, C-859, C-860, C-861, C-862, C-863, C-864, C-865, C-866, C-867, C-868, C-869, C-870, C-871, C-872, C-873, C-874, C-875, C-876, C-877, C-878, C-879, C-880, C-881, C-882, C-883, C-884, C-885, C-886, C-887, C-888, C-889, C-890, C-891, C-892, C-893, C-894, C-895, C-896, C-897, C-898, C-899, C-900, C-901, C-902, C-903, C-904, C-905, C-906, C-907, C-908, C-909, C-910, C-911, C-912, C-913, C-914, C-915, C-916, C-917, C-918, C-919, C-920, C-921, C-922, C-923, C-924, C-925, C-926, C-927, C-928, C-929, C-930, C-931, C-932, C-933, C-934, C-935, C-936, C-937, C-938, C-939, C-940, C-941, C-942, C-943, C-944, C-945, C-946, C-947, C-948, C-949, C-950, C-951, C-952, C-953, C-954, C-955, C-956, C-957, C-958, C-959, C-960, C-961, C-962, C-963, C-964, C-965, C-966, C-967, C-968, C-969, C-970, C-971, C-972, C-973, C-974, C-975, C-976, C-977, C-978, C-979, C-980, C-981, C-982, C-983, C-984, C-985, C-986, C-987, C-988, C-989, C-990, C-991, C-992, C-993, C-994, C-995, C-996, C-997, C-998, C-999, C-1000										1	2	3	4	5	6	7	8	9
1	Unit	TOE	Weight of pers equip and sup (STON)		Type of aift combi- nation	Aift requirements			TOE items transportable by C-5A only (see table 6-36)									
			Trans	Non- trans		C-130	C-124	C-141										
	Inf div base:																	
2	Div HHC-----	7-4G	-----	-----	1	16	-----	-----										
			252	-----	2	-----	13	-----										
			-----	-----	3	-----	-----	8	-----									
3	MP co-----	19-27G	-----	-----	1	12	-----	-----										
			182	-----	2	-----	10	-----										
			-----	-----	3	-----	-----	6	-----									
4	Avn bn-----	1-75G	600	236	1	23	12	-----	X									
			-----	-----	2	-----	30	-----										
			-----	-----	3	-----	11	11	-----									
5	Sig bn-----	11-35G	-----	-----	1	71	14	-----										
			1,439	-----	2	-----	72	-----										
			-----	-----	3	-----	1	41	-----									
6	Engr bn-----	5-155G	2,190	1,410	1	77	47	-----	X									
			-----	-----	2	-----	110	-----										
			-----	-----	3	-----	47	36	-----									
7	Bde HHC-----	7-42G	863	9	1	46	6	-----	X									
			-----	-----	2	-----	44	-----										
			-----	-----	3	-----	3	23	-----									
8	Armd cav sqdn-----	17-105G	1,663	1,500	1	99	3	-----	X									
			-----	-----	2	-----	84	-----										
			-----	-----	3	-----	1	7	-----									
9	Div arty-----	6-100G	6,019	382	1	341	24	-----	X									
			-----	-----	2	-----	301	-----										
			-----	-----	3	-----	13	165	-----									
10	DISCOM-----	29-1G	3,959	881	1	206	32	-----	X									
			-----	-----	2	-----	198	-----										
			-----	-----	3	-----	31	96	-----									
11	ADA bn-----	44-235G	1,670	94	1	102	3	-----	X									
			-----	-----	2	-----	84	-----										
			-----	-----	3	-----	2	47	-----									

Table 6-3. Continued
c. Infantry Division Equipment

1		2		3	4	5	6
1	LIN	Item	Weight (Lb)	Reduced Dimensions (in)			
				Length	Width	Height	
Avn bn, TOE 1-75G							
2	K30645	Hel, obsn, OH-6A	1,532	280	103	100	
3	K31749	Hel, util, UH-1B	5,665	480	101	123	
4	K31786	Hel, util, UH-1D	6,161	513	103	105	
Engr bn, TOE 5-155G							
5	C20414	Brg, armd-veh-launched, scissor-type, cl 60, aluminum, 60-ft long	27,700	264	67	33	
6	C25620	Brg, fltg, mbl, aslt, amph	21,000	433	120	124	
7	E56577	CEV, full-tracked (T118E1)	108,080	288	145	128	
8	F39378	Crane, wheel-mtd, 20-ton, ¾-cu yd, rough terrain	58,582	344	127	149	
9	R11462	Ramp, loading, veh, mbl, aslt, amph, fltbrg	51,400	472	120	140	
10	R50680	Recov veh, full-tracked, mdm	107,600	321	135	118	
11	S74832	Stlr, van, cgo, 6-ton, 4-wheel, with equip	17,200	322	98	130	
12	W76816	Trac, full-tracked, low-spd, diesel, hv DBP, with bulldozer, WWN	44,140	202	122	94	
Div arty, TOE 6-100G							
13	K12718	Hdlg unit, rkt, tlr-mtd, 762-mm, with equip (HJ)	9,780	337	97	116	
14	K30645	Hel, obsn, OH-6A	1,532	280	103	100	
15	K31749	Hel, util, UH-1B	5,665	480	101	123	
16	K56981	How, hv, SP, 8-in	53,000	265	124	109	
17	R50543	Recov veh, full-tracked, lt, armd	44,975	260	126	116	
Bde HHC, TOE 7-42G							
18	K30645	Hel, obsn, OH-6A	1,532	280	103	100	

Table 6-3. Continued
c. Infantry Division Equipment—Continued

3. Infantry Division Equipment - Continued							
1			2	3	4	5	6
1	LIN	Item	Weight (Lb)	Reduced Dimensions (in)			
				Length	Width	Height	
Armd cav sqdn, TOE 17-105G							
19	K30645	Hel, obsn, OH-6A	1,532	280	103	100	
20	K31749	Hel, util, UH-1B	5,665	480	101	123	
21	K31786	Hel, util, UH-1D	6,161	513	103	105	
22	R50543	Recov veh, full-tracked, lt, armd	44,975	260	126	116	
23	V12826	Tk, cbt, full-tracked, 76-mm gun	44,691	277	124	108	
DISCOM, TOE 29-1G							
24	R50608	Recov veh, full-tracked, mdm, armd	107,600	321	135	118	
25	S73394	Stlr, tk trans, 50-ton, 8-wheel, with equip	45,870	478	125	94	
26	S74490	Stlr, van, expansible, 6-ton, 4-wheel, with equip	16,343	322	99	136	
ADA bn, TOE 44-325T							
27	R50543	Recov veh, full-tracked, lt, armd	44,975	260	126	116	

d. Infantry Division (Mechanized) Base

d. Infantry Division (Mechanized) Base									
	1	2	3	4	5	6	7	8	9
1	Unit	TOE	Weight of pers equip and sup (STON)		Type of acft combi- nation	Acft requirements			TOE items transportable by C-5A only (see table 6-36)
			Trans	Non- trans		C-130	C-124	C-141	
	Inf div (mech) base:								
2	Div HHC-----	37-4G	311.29	7.28	1	16	3		X
					2		16		
					3		3	8	
3	MP co-----	19-27G	182.00		1	12			
					2		10		
					3			6	
4	Sig bn-----	11-35G	1,439.00		1	72	14		
					2		72		
					3		1	41	
5	Engr bn-----	5-145G	2,072.02	957.16	1	107	17		X
					2		104		
					3		17	50	
6	Bde HHC-----	37-42G	1,919.99	7.24	1	83	29		X
					2		96		
					3		29	39	
7	Armd cav sqdn-----	17-105G	1,663.00	1,500.00	1	99	3		X
					2		84		
					3		1	42	
8	Div arty-----	6-300G	6,770.85	2,158.36	1	385	26		X
					2		339		
					3		15	185	
9	DISCOM-----	29-11G	4,801.16	1,032.27	1	243	43		X
					2		241		
					3		43	113	

e. Infantry Division (Mechanized) Equipment

1		2		3	4	5	6
1	LIN	Item	Weight (Lb)	Reduced Dimensions (in)			
				Length	Width	Height	
Div HHC, TOE 37-4G							
2	K30645	Hel, obsn, OH-6A	1,532	280	103	100	
3	K31686	Hel, util, UH-1D	6,161	513	103	105	
Engr bn, TOE 5-145G							
4	C20414	Brg, armd-veh-launched, scissor-type, cl 60, aluminum, 60-ft long	27,700	264	67	33	
5	E56577	CEV, full-tracked	108,080	288	145	128	
6	F39378	Crane, wheel-mtd, 20-ton, ¾-cu yd, rough terrain	58,582	344	127	149	
7	L43664	Lchr, M60-series, tk chassis, trans 40- and 60-ft brg	83,000	342	145	121	
8	R11462	Ramp, loading, veh, mbl, aslt, amph, fltbrg	51,400	472	120	140	
9	R50680	Recov veh, full-tracked, mdm, armd	107,600	321	135	118	
10	W76816	Trac, full-tracked, low-spd, diesel, with bulldozer	44,140	202	122	94	

Table 6-3. Continued
e. Infantry Division (Mechanized) Equipment—Continued

1		2		3	4	5	6
1	LIN	Item	Weight (Lb)	Reduced Dimensions (in)			
				Length	Width	Height	
Div arty, TOE 6-300G							
11	K12718	Hdls unit, rkt, tlr-mtd, 762-mm, with equip (HJ)-----	9,780	337	97	116	
12	K30645	Hel, obsn, OH-6A-----	1,532	280	103	100	
13	K31749	Hel, util, UH-1B-----	5,665	480	101	123	
14	K56981	How, hv, SP, 8-in-----	53,000	265	124	109	
15	K57666	How, mdm, SP, 155-mm-----	44,437	241	128	110	
16	R50543	Recov veh, full-tracked, lt, armd-----	44,975	260	126	116	
17	R50680	Recov veh, full-tracked, mdm, armd-----	107,600	321	135	118	
Armd cav sqdn, TOE 17-105G							
18	K30645	Hel, obsn, OH-6A-----	1,532	280	103	100	
19	K31749	Hel, util, UH-1B-----	5,665	480	101	123	
20	K31786	Hel, util, UH-1D-----	6,161	513	103	105	
21	R50543	Recov veh, full-tracked, lt, armd-----	44,975	260	126	116	
22	V12826	Tk, cbt, full-tracked, 76-mm gun-----	44,691	277	124	108	
DISCOM, TOE 29-11G							
23	K31786	Hel, util, UH-1D-----	6,161	513	103	105	
24	R50680	Recov veh, full-tracked, mdm, armd-----	107,600	321	135	118	
25	S72983	Stlr, tk, fuel-svc, 5,000-gal-----	15,470	377	97	109	
26	S73394	Stlr, tk trans, 50-ton, 8-wheel, with equip-----	45,870	478	125	94	
27	T18221	Shop set, acft maint, fxd base, set A-----	525	-----	-----	-----	
Bde HHC, TOE 37-42G							
28	K30645	Hel, obsn, OH-6A-----	1,532	280	103	100	

f. Armored Division Base

J. Armored Division Base									
	1	2	3	4	5	6	7	8	9
1	Unit	TOE	Weight of pers equip and sup (STON)		Type of acft combi- nation	Acft requirements			TOE items transportable by C-5A only (see table 6-36)
			Trans	Non- trans		C-130	C-124	C-141	
2	Armd div base: Div HHC-----	17-4G	322.44	-----	1	18	2	-----	-----
			-----	-----	2	-----	17	-----	-----
			-----	-----	3	-----	2	9	-----
3	MP co-----	19-27G	182.00	-----	1	12	-----	-----	-----
			-----	-----	2	-----	10	-----	-----
			-----	-----	3	-----	-----	6	-----
4	Sig bn-----	11-35G	1,439.00	-----	1	72	14	-----	-----
			-----	-----	2	-----	72	-----	-----
			-----	-----	3	-----	1	41	-----
5	Engr bn-----	5-145G	2,072.02	957.16	1	107	17	-----	X
			-----	-----	2	-----	104	-----	-----
			-----	-----	3	-----	17	50	-----
6	Bde HHC-----	17-42G	1,650.94	64.02	1	102	-----	-----	X
			-----	-----	2	-----	83	-----	-----
			-----	-----	3	-----	-----	48	-----
7	Armd cav sqdn-----	17-105G	1,663.00	1,500.00	1	99	3	-----	X
			-----	-----	2	-----	84	-----	-----
			-----	-----	3	-----	1	42	-----
8	Div arty-----	6-300G	6,770.85	2,158.36	1	385	26	-----	X
			-----	-----	2	-----	339	-----	-----
			-----	-----	3	-----	15	185	-----
9	DISCOM-----	29-21G	7,735.60	1,430.91	1	346	106	-----	X
			-----	-----	2	-----	387	-----	-----
			-----	-----	3	-----	105	162	-----
10	ADA bn-----	44-235G	1,670.00	94.00	1	101	3	-----	X
			-----	-----	2	-----	84	-----	-----
			-----	-----	3	-----	2	47	-----

Table 6-3. Continued
g. Armored Division Equipment

g. Armored Division Equipment						
1	2	3	4	5	6	
1	LIN	Item	Weight (Lb)	Reduced Dimensions (in)		
				Length	Width	Height
Engr bn, TOE 5-145G						
2	C20414	Brg, armd-veh-launched, scissor-type, cl 60, aluminum, 60-ft long	27,700	264	67	33
3	E56577	CEV, full-tracked	108,080	288	145	128
4	F39378	Crane, wheel-mtd, 20-ton, 3/4-cu yd, rough terrain	58,582	344	127	149
5	L43664	Lchr, M60-series, tk chassis, trans 40- and 60-ft brg	83,000	342	145	121
6	R11462	Ramp, loading, veh, mbl aslt, amph, fltbrg	51,400	472	120	140
7	R50680	Recov veh, full-tracked, mdm, armd	107,600	321	135	118
8	W76816	Trac, full-tracked, low-spd, diesel, with bulldozer	44,140	202	122	94
Div arty, TOE 6-300G						
9	K12718	Hdlg unit, rkt, tlr-mtd, 760-mm, with equip	9,780	337	97	116
10	K30645	Hel, obsn, OH-6A	1,532	280	103	100
11	K31749	Hel, util, UH-1B	5,665	480	101	123
12	K56981	How, hv, SP, 8-in	53,000	265	124	109
13	K57666	How, mdm, SP, 155-mm	44,437	241	128	110
14	R50543	Recov veh, full-tracked, lt, armd	44,975	260	126	116
15	R50680	Recov veh, full-tracked, mdm, armd	107,600	321	135	118
Bde HHC, TOE 17-42G						
16	K30645	Hel, obsn, OH-6A	1,532	280	103	100
17	R50543	Recov veh, full-tracked, lt, armd	44,975	260	126	116
Armd cav sqdn, TOE 17-105G						
18	K30645	Hel, obsn, OH-6A	1,532	280	103	100
19	K31749	Hel, util, UH-1B	5,665	480	101	123
20	K31786	Hel, util, UH-1D	6,161	513	103	105
21	R50543	Recov veh, full-tracked, lt armd	44,975	260	126	116
22	V12826	Tk, cbt, full-tracked, 76-mm gun	44,691	277	124	108
DISCOM, TOE 29-21G						
23	K31786	Hel, util, UH-1D	6,161	513	103	105
24	Q53741	Radio set, AN/VRC-46, mtd in TRV	54	327	139	119
25	S73394	Stlr, tk trans, 50-ton, 8-wheel, with equip	45,870	478	125	94
26	S74490	Stlr, van, expansible, 6-ton, 4-wheel, with equip	16,343	322	99	136
27	T18221	Shop set, acft maint, fxd base, set A	525			
28	T21235	Shop set, acft maint, stlr-mtd, A-1, toolcrib, elec flaw detection	21,280	322	98	135
29	T21372	Shop set, acft maint, stlr-mtd, A-2, sheetmetal welding hyd	21,910	322	98	135
ADA bn, TOE 44-325G						
30	R50543	Recov veh, full-tracked, lt, armd	44,975	260	126	116

h. Combat Units

N. Combat Units								
	1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of pers equip and sup (STON)	Type of acft combi- nation	Acft requirements			TOE items transportable by C-5A only (see table 6-36)
					C-130	C-124	C-141	
	Sep bde base							
2	Sep inf bde.....	7-100G	5,109.6	1	220	43		X
				2		216		
				3		42	110	
3	HHC.....	7-102G	309.9	1	17	4		
				2		16		
				3		4	8	
4	Armd cav trp.....	17-107G	705.7	1	23	5		X
				2		23		
				3		5	12	
5	Avn co.....	1-47G	195.6	1	12	1		
				2		10		
				3		1	6	
6	Engr co.....	5-107G	1,259.9	1	23	10		X
				2		29		
				3		10	12	
7	FA bn, 105-mm, towed	6-185G	924.0	1	57	3		
				2		47		
				3		3	28	

Table 6-3—Continued
h. Combat Units—Continued

1	Unit	TOE	Weight of pers equip and sup (STON)	Type of acft combi- nation	Acft requirements			TOE items transportable by C-5A only (see table 6-36)
					C-130	C-124	C-141	
8	Spt bn.....	29-135G	1,714.5	1	88	20		X
				2		91		
				3		19	44	
9	HHD.....	29-76G	71.4	1	5			
				2		5		
				3			3	
10	Admin co.....	12-177G	61.2	1	5	1		
				2		4		
				3		1	2	
11	Med co.....	8-147G	185.6	1	13			
				2		10		
				3			6	
12	S&T co.....	29-77G	669.1	1	33	8		
				2		35		
				3		8	16	
13	Maint co.....	29-99G	727.2	1	32	11		X
				2		37		
				3		10	17	
14	Sep armd bde.....	17-100G	4,780.7	1	262	42		X
				2		229		
				3		42	126	
15	HHC.....	17-102G	481.4	1	24	7		
				2		25		
				3		7	12	
16	Armd cav trp.....	17-107G	705.8	1	23	5		X
				2		23		
				3		5	12	
17	Engr co.....	5-127G	1,201.0	1	20	28		
				2		44		
				3		28	10	
18	FA bn, 105-mm, SP.....	6-385G	1,330.5	1	52	27		X
				2		68		
				3		27	26	
19	HQ, H&S btry.....	6-386G	490.5	1	22	6		X
				2		23		
				3		6	11	
20	3 FA btry (each).....	6-347G	280.0	1	10	7		X
				2		15		
				3		7	5	
21	Spt bn.....	29-75G	1,717.8	1	76	17		X
				2		69		
				3		17	37	
22	HHD.....	29-76G	71.4	1	5			
				2		5		
				3			3	
23	S&T co.....	29-77G	669.1	1	33	8		
				2		35		
				3		8	16	
24	Maint co.....	29-79G	730.3	1	23	9		X
				2		28		
				3		9	12	
25	Med co.....	8-147G	185.6	1	13			
				2		10		
				3			6	
26	Admin co.....	12-177G	61.2	1	5	1		
				2		4		
				3		1	2	
27	Sep inf bde (mech).....	37-100G	5,165.7	1	200	64		X
				2		220		
				3		64	97	

Table 6-3—Continued
h. Combat Units—Continued

n. Combat Units Continued															
1		2		3		4		5		6		7		8	
1	Unit	TOE	Weight of pers equip and sup (STON)	Type of acft combi- nation	Acft requirements			TOE items transportable by C-5A only (see table 6-36)							
					C-130	C-124	C-141								
28	HHC.....	37-102G	438.2	1	21	1									
				2		22									
				3		1	10								
29	Armd cav trp.....	17-107G	705.7	1	23	5		X							
				2		23									
				3		5	12								
30	Engr co.....	5-127G	805.8	1	20	28									
				2		44									
				3		28	10								
31	Spt bn.....	29-75G	1,717.7	1	76	17		X							
				2		69									
				3		17	37								
32	FA bn, 155-mm, SP.....	6-375G	1,498.3	1	85	8		X							
				2		74									
				3		8	41								
33	HHB.....	6-376G	278.5	1	12	5									
				2		13									
				3		5	7								
34	3 FA btry (each).....	6-367G	277.4	1	18	1		X							
				2		15									
				3		1	9								
35	Svc brty.....	6-369G	387.6	1	23	1		X							
				2		19									
				3		1	12								
Inf units															
36	Inf bn, sep inf bde.....	7-15G	609.1	1	41	8									
				2		31									
				3		8	21								
37	HHC.....	7-16G	407.2	1	26	2									
				2		21									
				3		2	12								
38	3 rifle co (each).....	7-18G	67.3	1	5										
				2		4									
				3			4								
39	Inf bn (mech), sep bde.....	7-45G	608.1	1	38	30		X							
				2		59									
				3		30	19								
40	HHC.....	7-46G	395.9	1	19	4		X							
				2		18									
				3		4	10								
41	3 rifle co (each).....	7-47G	69.3	1	8	9		X							
				2		15									
				3		9	5								
42	Inf LRP co.....	7-157E	193.4	1	14										
				2		11									
				3			7								
43	Inf set dog plat.....	7-167E	34.0	1	3										
				2		3									
				3			2								
44	Inf pfdr plat, abn.....	7-168E		1	1										
				2		1									
				3			1								
Armor units															
45	Tk bn, sep bde.....	17-35G	4,223.0	1	62	14		X							
				2		62									
				3		14	30								
46	HHC.....	17-36G	1,159.4	1	36	13		X							
				2		41									
				3		13	17								

Table 6-8—Continued
h. *Combat Units*—Continued

1	Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of a/c combi- nation	6 A/cft requirements			8 TOE items transportable by C-5A only (see table 6-36)
					C-130	C-124	C-141	
47	3 tk co (each)	17-37G	1,021.2	1	9	1		X
				2		8		
				3		1	5	
48	Armd cav regt	17-51G	11,698.8	1	412	82		
				2		406		
				3		82	197	
49	HHT	17-52G	366.1	1	15	6		X
				2		18		
				3		6	8	
50	Air cav trp	17-58G	199.9	1	13	1		
				2		11		
				3		1	7	
51	3 armd cav sqdn (each) ..	17-55G	3,710.7	1	129	25		X
				2		127		
				3		25	62	
52	HHT	17-56G	795.6	1	35	9		X
				2		36		
				3		9	17	
53	3 armd cav trp (each)	17-57G	611.6	1	31	5		X
				2		30		
				3		5	16	
54	Tk co	17-27G	1,023.6	1	9	2		X
				2		8		
				3		2	4	
55	FA btry, 155-mm, SP ..	6-37G	392.7	1	16	1		X
				2		13		
				3		1	8	

i. *Combat Support Units*

A. General Support Units								
1	2	3	4	5	6	7	8	
1	Unit	TOE	Weight of pers equip and sup (STON)	Type of a/cft combi- nation	A/cft requirements			TOE items transportable by C-5A only (see table 6-36)
					C-130	C-124	C-141	
FA units								
2	HHB, FA gp-----	6-401G	161.7	1	11	-----	-----	
				2	-----	10	-----	
				3	-----	-----	5	-----
3	FA bn, 155-mm, towed-----	6-425G	1,101.2	1	72	2	-----	
				2	-----	63	-----	
				3	-----	2	31	-----
4	HHB-----	6-426G	140.3	1	9	1	-----	
				2	-----	9	-----	
				3	-----	1	4	-----
5	3 FA btry (each)-----	6-427G	246.7	1	8	-----	-----	
				2	-----	6	-----	X
				3	-----	-----	4	-----
6	Svc btry-----	6-429G	238.4	1	15	1	-----	
				2	-----	14	-----	
				3	-----	1	7	-----
7	FA bn, 175-mm, SP-----	6-435G	1,334.7	1	59	3	-----	X
				2	-----	50	-----	
				3	-----	3	29	-----
8	HHB-----	6-436G	154.8	1	10	1	-----	
				2	-----	8	-----	
				3	-----	1	4	-----
9	3 FA btry (each)-----	6-437G	299.1	1	12	1	-----	X
				2	-----	10	-----	
				3	-----	1	6	-----

Table 6-3—Continued
i. Combat Support Units—Continued

i. Combat Support Units—Continued							
1	2	3	4	5	6	7	8
1	Unit	TOE	Weight of pers equip and sup (STON)	Type of acft combi- nation	Acft requirements		TOE items transportable by C-5A only (see table 6-36)
					C-130	C-124		C-141
10	Svc btry.....	6-439G	258.1	1	14	1	X
				2		13	
				3		1	7
11	FA bn, 8-in, SP.....	6-445G	1,390.3	1	58	6	X
				2		52	
				3		6	29
12	HHB.....	6-416G	163.0	1	10	1	
				2		10	
				3		1	5
13	3 FA btry (each).....	6-447G	320.3	1	17	2	
				2		22	
				3		2	9
14	Svc btry.....	6-449G	271.3	1	13	1	X
				2		12	
				3		1	7
15	FA bn, 155-mm, SP.....	6-455G	1,409.2	1	55	4	X
				2		48	
				3		4	27
16	HHB.....	6-456G	153.0	1	8	2	
				2		9	
				3		2	4
17	3 FA btry (each).....	6-457G	334.3	1	11	1	X
				2		10	
				3		1	6
18	Svc btry.....	6-459G	250.5	1	13	1	X
				2		12	
				3		1	7
19	FA scdy tm (FA).....	6-500G		1	1		
				2		1	
				3			1
20	HHB, corps arty.....	6-501G	260.0	1	15	2	
				2		18	
				3		2	7
21	FA bn, HJ.....	6-525G	905.6	1	46	13	
				2		52	
				3		13	20
22	HQ, H&S btry.....	6-526G	302.5	1	18	2	
				2		18	
				3		2	8
23	3 FA btry (each).....	6-527G	201.0	1	9	4	
				2		12	
				3		4	4
24	FA bn, SGT.....	6-555G	943.4	1	51	11	
				2		54	
				3		11	22
25	HQ, H&S btry.....	6-556G	496.0	1	25	7	
				2		22	
				3		7	11
26	2 FA btry (each).....	6-557G	223.7	1	11	4	
				2		13	
				3		4	7
27	FA btry, slt.....	6-558G	173.3	1	12		
				2		10	
				3			5
28	FATAB.....	6-575G	1,149.1	1	68	8	
				2		66	
				3		8	29
29	HHB.....	6-576G	329.5	1	20	2	
				2		19	
				3		2	9

Table 6-3—Continued
i. Combat Support Units—Continued

C-5A Support Units - Continued								
1	2	3	4	5	6	7	8	
1	Unit	TOE	Weight of pers equip and sup (STON)	Type of acft combi- nation	Acft requirements			TOE items transportable by C-5A only (see table 6-36)
					C-130	C-124	C-141	
30	3 FA btry (each) -----	6-577G	243.6	1	14	2		
				2		14		
				3		2	6	
31	FA bn, PERSH -----	6-615G	2,572.2	1	144	24	X	
				2		147		
				3		24	62	
32	HHB -----	6-616G	232.2	1	15	1		
				2		14		
				3		1	7	
33	4 FA btry (each) -----	6-617G	372.3	1	21	4		
				2		22		
				3		4	9	
34	Svc btry -----	6-619G	850.8	1	48	8	X	
				2		49		
				3		8	21	
ADA units								
35	HHB, ADA bde -----	44-2G	125.5	1	9			
				2		8		
				3			4	
36	ADA tgt det -----	44-8G		1	1			
				2		1		
				3			1	
37	HHB, ADA gp -----	44-12G	110.3	1	7			
				2		6		
				3			4	
38	ADA AW bn, SP -----	44-85G	1,561.8	1	67	32	X	
				2		78		
				3		32	29	
39	HHB -----	44-86G	243.8	1	14	1	X	
				2		12		
				3		1	7	
40	4 ADA AW btry SP (each) -----	44-87G	329.5	1	13	8		
				2		19		
				3		8	6	
41	ADA bn, HAWK -----	44-235G	772.3	1	41	9		
				2		45		
				3		9	18	
42	ADA bn, HERC -----	44-535G	1,621.4	1	105	3		
				2		93		
				3		3	45	
43	HHB -----	44-536G	785.4	1	47	3		
				2		40		
				3		3	22	
44	4 ADA btry (each) -----	44-537G	209.0	1	14			
				2		12		
				3			6	
Avn units								
45	Avn co (airmb) -----	1-77G	172.2	1	11	1		
				2		10		
				3		1	5	
46	Corps avn co -----	1-127G	247.9	1	11	5		
				2		15		
				3		5	5	
47	Avn aerial survl co -----	1-128T	416.9	1	26	2		
				2		24		
				3		2	11	
48	AAVN co -----	1-137D	237.4	1	12	4		
				2		14		
				3		4	5	

Table 6-3—Continued
i. Combat Support Units—Continued

i. Combat Support Units—Continued								
1		2	3	4	5	6	7	8
1	Unit	TOE	Weight of pers equip and sup (STON)	Type of acft combi- nation	Acft requirements			TOE items transportable by C-5A only (see table 6-36)
					C-130	C-124	C-141	
49	Avn ATC co.....	1-207E	971.8	1	29	31		
				2		56		
				3		31	13	
	<i>Cml units</i>							
50	HHD, cml gp.....	3-32G	25.1	1	2			
				2		2		
				3			1	
51	HHD, cml smoke genr bn...	3-266G	24.5	1	2			
				2		2		
				3			1	
52	Cml smoke genr co.....	3-267G	217.3	1	15			
				2		13		
				3			7	
	<i>Engr units</i>							
53	Engr cbt bn, army or corps..	5-35G	2,164.2	1	99	39		
				2		124		
				3		39	43	
54	HHC.....	5-36G	617.9	1	34	7		
				2		36		
				3		7	15	
55	4 engr cbt co (each)....	5-37G	486.6	1	24	8		
				2		27		
				3		8	14	
56	HHC, engr cbt gp.....	5-52G	142.0	1	10			
				2		9		
				3			5	
57	Engr aslt brg co.....	5-64G	351.3	1	15	8		X
				2		21		
				3		8	7	
58	Engr pnl brg co.....	5-77G	479.4	1	6	20		X
				2		24		
				3		20	3	
59	Engr fltbrg co.....	5-78G	614.0	1	31	3		X
				2		27		
				3		3	15	
60	Engr cam co.....	5-97G	54.4	1	4			
				2		4		
				3			2	
61	HHC, engr cbt bde, army...	5-101E	63.0	1	5			
				2		4		
				3			2	
62	HHC, engr cbt bde, corps...	5-101E	63.0	1	5			
				2		4		
				3			2	
63	Engr dptrk co.....	5-124G	602.0	1	8	28		
				2		35		
				3		28	4	
64	Engr topo bn, army.....	5-305G	603.4	1	34	6		
				2		35		
				3		6	15	
65	HHC.....	5-306G	321.0	1	18	3		
				2		19		
				3		3	8	
66	Engr map repro and distr co, army.....	5-307G	160.4	1	10	1		
				2		10		
				3		1	5	
67	Engr pmap co, army...	5-308G	133.1	1	6	3		
				2		8		
				3		3	2	

Table 6-3—Continued
i. Combat Support Units—Continued

1		2		3		4		5		6		7		8	
1	Unit	TOE	Weight of pers equip and sup (STON)	Type of aflt combi- nation	Acft requirements			TOE items transportable by C-5A only (see table 6-36)							
					C-130	C-124	C-141								
68	Engr topo co, corps.....	5-327G	229.7	1	12	3									
				2		14									
				3		3	6								
69	HHC, engr amph bde.....	5-401G	115.4	1	8										
				2		7									
				3			4								
70	HHC, engr amph gp.....	5-402G	130.4	1	9										
				2		8									
				3			4								
71	Engr amph bn.....	5-405G	1,846.6	1	104	17		X							
				2		106									
				3		17	45								
72	HHC.....	5-406G	954.6	1	51	4		X							
				2		44									
				3		4	24								
73	2 engr amph aslt co (each).....	5-407G	134.8	1	8	1		X							
				2		8									
				3		1	4								
74	Engr amph co.....	5-408G	622.4	1	29	11		X							
				2		36									
				3		11	13								
MI units															
75	MI bn, air recon spt, fld army.....	30-5G	387.1	1	26										
				2		23									
				3			12								
76	HHC.....	30-6G	113.9	1	8										
				2		7									
				3			4								
77	4 MID (each).....	30-7G	68.3	1	5										
				2		4									
				3			2								
78	MID, sep inf bde.....	30-14G	39.6	1	2	1									
				2		2									
				3		1	1								
79	MID, armd cav regt.....	30-14G	39.6	1	2	1									
				2		2									
				3		1	1								
80	MID, div.....	30-17G	82.8	1	5	1									
				2		5									
				3		1	3								
81	MID, corps.....	30-18G	75.7	1	6										
				2		5									
				3			3								
82	MI bn, fld army.....	30-25E	756.0	1	51										
				2		44									
				3			22								
83	HHC.....	30-26G	185.7	1	13										
				2		11									
				3			6								
84	MI co, intg.....	30-27G	49.4	1	4										
				2		3									
				3			2								
85	MI co, ci.....	30-28G	165.2	1	12										
				2		10									
				3			5								
86	MI co, coll.....	30-29G	184.7	1	13										
				2		11									
				3			6								

Table 6-3—Continued
i. Combat Support Units—Continued

1	Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of acft combi- nation	6 Acft requirements			8 TOE items transportable by C-5A only (see table 6-36)
					C-130	C-124	C-141	
87	MI co, TI.....	30-34G	171.0	1	12			
				2		10		
				3			5	
	<i>Army Security Agency (ASA) units</i>							
88	HHC, ASA gp.....	32-52G	256.1	1	14	3		
				2		15		
				3		3	6	
89	HHC, ASA bn.....	32-56G	239.7	1	16	2		
				2		14		
				3		2	7	
90	ASA div spt co.....	32-57G	237.4	1	16			
				2		14		
				3			7	
91	ASA op co (A).....	32-67G	431.7	1	27	2		
				2		25		
				3		2	12	
92	ASA proc co.....	32-77G	266.0	1	17	1		
				2		16		
				3		1	8	
93	ASA scty co.....	32-78G	166.0	1	9	2		
				2		10		
				3		2	4	
	<i>Sig units</i>							
94	Corps sig bn.....	11-15G	1,382.7	1	89	3		
				2		80		
				3		3	39	
95	HHC.....	11-16G	273.3	1	19			
				2		16		
				3			8	
96	CO co.....	11-17G	431.6	1	29			
				2		25		
				3			13	
97	Comd RADREL co.....	11-18G	677.8	1	42	3		
				2		39		
				3		3	18	
98	Sig army area bn.....	11-85G	1,610.7	1	101	6		
				2		93		
				3		6	44	
99	HHC.....	11-86G	243.6	1	14	2		
				2		14		
				3		2	6	
100	Sig army area co.....	11-87G	340.3	1	21	2		
				2		20		
				3		2	9	
101	Army comd sig op bn.....	11-95G	2,424.4	1	153	8		
				2		139		
				3		8	66	
102	Sig op co, mdm HQ.....	11-127G	278.5	1	16	3		
				2		16		
				3		3	7	
103	Sig small HQ op co.....	11-147G	160.7	1	11			
				2		10		
				3			5	

Table 6-3—Continued
j. Combat Service Support Units

J. General Service Support Units															
1		2		3		4		5		6		7		8	
1	Unit	TOE	Weight of pers equip and sup (STON)	Type of acft combi- nation	Acft requirements			TOE items transportable by C-5A only (see table 6-36)							
					C-130	C-124	C-141								
Ammo units															
2	HHC, ammo DS/GS gp----	9-22G	70.2	1	4	1									
				2		5									
				3		1	2								
3	HHC, ammo bn, DS/GS---	9-36G	211.2	1	11	3									
				2		13									
				3		3	5								
4	Ammo co, convl-----	9-38G	645.1	1	27	6									X
				2		27									
				3		9	14								
5	Sp ammo sup co, msl-----	9-47G	1,183.5	1	17	7									
				2		68									
				3		10	31								
6	Ord sp ammo co, GS/DS---	9-48G	727.3	1	34	13									
				2		42									
				3		8	15								
7	Ord co, GM GS maint-----	9-59G	742.3	1	36	12									
				2		43									
				3		10	17								
Maint units															
8	Tire rep co-----	9-117G	349.5	1	19	4									
				2		20									
				3		4	8								
9	LE GS maint co, army-----	29-134G	570.7	1	27	7									X
				2		28									
				3		7	13								
10	HHD, maint DS or GS bn, army-----	29-136G	53.4	1	4										
				2		4									
				3			2								
11	Hv equip GS maint co, army	29-137G	655.3	1	27	4									X
				2		24									
				3		4	12								
12	Coll and clas co-----	29-139G	785.8	1	37	7									X
				2		36									
				3		7	18								
13	Lt maint co, DS-----	29-207G	276.9	1	13	5									
				2		16									
				3		5	6								
14	Maint mgt det, FASCOM--	29-403T	2.8	1	1										
				2		1									
				3			1								
15	Maint mgt det, spt bde----	29-403T	3.8	1	1										
				2		1									
				3			1								
16	Trans acft DS co-----	55-457G	531.8	1	31	4									X
				2		31									
				3		2	14								
17	Trans acft maint GS co----	55-458G	352.8	1	21	3									
				2		21									
				3		1	10								
Med units															
18	Med holding co-----	8-57G	37.4	1	3										
				2		3									
				3			2								
19	HHD, med bde-----	8-112G	48.6	1	4										
				2		3									
20	HHD, med gp-----	8-122G	30.2	1	2										
				2		3									
				3			1								

Table 6-3—Continued
j. Combat Service Support Units—Continued

J. Combat Service Support Units															
1		2		3		4		5		6		7		8	
1	Unit	TOE	Weight of pers equip and sup (STON)	Type of acft combi- nation	Acft requirements			TOE items transportable by C-5A only (see table 6-36)							
					C-130	C-124	C-141								
21	Cbt spt hosp.....	8-123T	224.4	1	15										
				2		13									
				3				7							
22	HHD, med bn.....	8-126G	47.8	1	3	1									
				2		4									
				3		1		2							
23	Med amb co.....	8-127G	173.5	1	12										
				2		10									
				3				5							
24	Med clr co.....	8-128G	108.7	1	8										
				2		7									
				3				4							
25	Med coll co.....	8-129G	57.5	1	4										
				2		4									
				3				2							
26	Med air amb co.....	8-137G	208.4	1	13	2									
				2		12									
				3		2		7							
27	Med co, sep bde.....	8-147G	185.4	1	13										
				2		11									
				3				6							
28	PVNTMED svcs unit, fld...	8-204G	120.2	1	8										
				2		7									
				3				4							
29	MASH.....	8-571G	153.0	1	11										
				2		9									
				3				5							
30	Evac hosp.....	8-581G	285.8	1	18	1									
				2		17									
				3		1		8							
31	Conv cen.....	8-590G	181.7	1	13										
				2		13									
				3				6							
32	Med lab.....	8-650G	119.5	1	8										
				2		7									
				3				4							
33	Army med dep.....	8-667G	273.1	1	18	1									
				2		15									
				3		1		8							
MP units															
34	HHD, MP bn.....	19-76G	51.5	1	4										
				2		3									
				3				2							
35	MP ESCRG co.....	19-47G	45.0	1	3										
				2		3									
				3				2							
36	MP co.....	19-77G	211.1	1	10	4									
				2		13									
				3		4		5							
37	MP phys scety co.....	19-97G	105.0	1	7										
				2		6									
				3				3							
38	MP gd co.....	19-247G	31.4	1	2										
				2		2									
				3				1							
39	HHD, MP bde.....	19-262G	58.7	1	3	1									
				2		3									
				3		1		2							

Table 6-3—Continued
j. Combat Service Support Units—Continued

3. Combat Service Support Units Continued									
1		2	3	4	5		6	7	8
1	Unit	TOE	Weight of pers equip and sup (STON)	Type of acft combi- nation	Acft requirements			TOE items transportable by C-5A only (see table 6-36)	
					C-130	C-124	C-141		
<i>S&S units</i>									
40	Fld svc co, GS fwd.....	29-114G	514.4	1	34	1			
				2		30			
				3		1	15		
41	Gen sup co, GS fwd.....	29-118G	425.0	1	24	3		X	
				2		22			
				3		3	12		
42	Rep parts GS co, fwd, corps	29-119G	414.8	1	24	4			
				2		24			
				3		4	11		
43	Rep parts GS co, army.....	29-119G	601.2	1	34	6			
				2		35			
				3		3	15		
44	Fld svc GS co, army.....	29-124G	298.9	1	18	2			
				2		18			
				3		2	9		
45	Hv mat sup GS co.....	29-127G	403.3	1	14	8		X	
				2		18			
				3		6	8		
46	HHC, S&S bn.....	29-146G	122.5	1	8	2			
				2		7			
				3		2	3		
47	Invt con co, FASCOM.....	29-402G	230.8	1	12	1		X	
				2		11			
				3		1	5		
48	HHC, avn bn.....	1-256G	64.5	1	5				
				2		4			
				3			2		
49	Avn mdm hel co.....	1-258G	187.2	1	11	2			
				2		11			
				3		2	6		
50	Avn hv hel co.....	1-259G	151.7	1	8	2			
				2		9			
				3		2	4		
51	HHD, trans MCC.....	55-6G	188.8	1	8				
				2		7			
				3			4		
52	HHD, TMT bn.....	55-16G	28.2	1	2				
				2		2			
				3			1		
53	Trans lt trk co (2 ½-ton)---	55-17G	581.7	1	38	1			
				2		34			
				3		2	17		
54	Trans lt trk co (5-ton)-----	55-17G	810.9	1	53	1			
				2		47			
				3		1	23		
55	QM air dlvr co.....	10-407H	454.2	1	22	7			
				2		23			
				3		3	13		
56	Trans mdm trk co (cgo)-----	55-18G	1,088.1	1	47	22			
				2		63			
				3		22	21		
57	Trans mdm trk co.....	55-18G	1,103.4	1	48	22			
				2		64			
				3		22	24		
58	Trans cgo, army.....	55-19G	207.7	1	13	1			
				2		12			
				3		1	6		

Table 6-3—Continued
j. Combat Service Support Units—Continued

1	Unit	2 TOE	3 Weight of pers equip and sup (STON)	4 Type of acft combi- nation	6 Acft requirements			8 TOE items transportable by C-5A only (see table 6-36)
					C-130	C-124	C-141	
59	Trans hv trk co.....	55-28G	1,249.2	1	10	1		X
				2		8		
				3		1	6	
60	Trans tac carr co.....	55-47D	790.0	1	13	23		X
				2		38		
				3		23	7	
61	HHC, trans bde.....	55-62F	64.4	1	5			
				2		4		
				3			2	
62	Trans lt-mdm trk co.....	55-67G	825.6	1	46	8		
				2		48		
				3		8	20	
63	Trans tml trk co.....	55-118G	618.7	1	34	7		
				2		36		
				3		7	15	
<i>Pers svc units</i>								
64	SPS det (8AB, 30FA).....	12-18G	27.1	1	2			
				2		2		
				3			1	
65	HHD, P&A bn, fld army...	12-66G	33.2	1	3			X
				2		2		
				3			1	
66	Per svc co (type F).....	12-67G	38.0	1	3			
				2		2		
				3			2	
67	Army band.....	12-107G	6.2	1	1			
				2		1		
				3			1	
68	Fin DS co.....	14-17G	35.2	1	3			
				2		2		
				3			2	

Section II. WATER

6-4. Water Terminals—General

a. *Types.* A terminal is a military or commercial facility used for the loading, unloading, and intransit handling of cargo or personnel by any of the various means of transportation. Normally, terminals also contain other facilities essential to operation such as maintenance facilities, classification yards, dock and lighterage facilities, management offices, storage facilities, and freight and passenger loading and unloading facilities as required. Water terminals, including ports and beaches, and inland terminals are treated in this section. (Air terminals are treated in para 6-41—6-45.)

b. *Elements of Terminal Planning.* There normally are five steps in terminal planning.

(1) *Step 1.* Computation of the terminal workload required to support the operation, expressed as cargo tonnage and number of personnel per day.

(2) *Step 2.* Estimation of the existing terminal capacity, which is the total tonnage and personnel that can be *received, processed,* and *cleared* through the terminal in a day.

(3) *Step 3.* Estimation of construction requirements for repair and rehabilitation of existing facilities and construction of new facilities necessary to increase the existing terminal capacity to equal the required terminal workload.

(4) *Step 4.* Estimation of the equipment requirement needed to process the required workload through the terminal with maximum efficiency.

(5) *Step 5.* Estimation of personnel requirements needed for administration and operation in processing the required workload through the terminal.

6-5. Water Terminals (Ports)

a. *General.* This paragraph deals with planning data for water terminals in the hands of the

enemy that will be opened for operation as soon as cleared. Therefore, data are based on the employment of Army personnel and ships' gear only for the unloading of ships. Appropriate allowances should be made for other circumstances, such as availability of civilian labor and terminal facilities (e.g., gantry cranes, barges, railways). Discharge of dry cargo from ships is accomplished by one of two methods:

(1) From vessels alongside a wharf onto the wharf.

(2) By lighters from a vessel anchored in the stream.

Petroleum tankers are discharged at wharveside or offshore by submarine pipelines. Throughout the discussion of water terminals, the basic period of time is a 20-hour day. This time generally is considered a complete round-the-clock working day in terminal operations; the other 4 hours of the day are taken up in delays inherent in the work, such as breakdowns, changing shifts, and meals. (For planning terminal discharge in forward areas when enemy action may be expected to cause work delays, 15 hours' working time per day may be estimated. Factors used may be reduced proportionately.) For general planning, the transportation terminal service company (TOE 55-117) is considered capable of discharging 720 STON per 20-hour working day. The transportation terminal transfer company (TOE 55-118) can transship 900 tons daily.

b. Water Terminal Capacity Estimation.

(1) *Factors.* Terminal throughput capacity is determined by three major factors, each of which may be expressed in terms of STON per day for planning and estimating purposes. All three factors should be accurately estimated even though the limiting factor may be obvious. These estimates indicate the facilities where improvement effort will yield the greatest return in terms of tonnage movement capability. The three major factors are —

(a) Terminal reception capacity is the number and type of ships that can be moved into the harbor or coastal area of the terminal per day. This capacity is an estimated tonnage that can be discharged daily from ships and is based solely on an evaluation of the physical facilities of the terminal.

(b) Terminal discharge capacity is the number of ships that can be discharged in the terminal per day. This capacity is based on the equipment and terminal service units available.

(c) Terminal clearance capacity is the amount of cargo and personnel that can be moved through and out of the terminal per day. This

capacity is based on the transportation network and units available for the movement of supplies from the terminal to depots or consumers.

(2) *Checklist for water terminal capacity estimation.*

(a) Collect and evaluate the following data; evaluate to determine water terminal reception capacity:¹

1. Channel depths.
2. Obstructions.
3. Enemy air activity.
4. Enemy surface activity.
5. Enemy submarine activity.
6. Climate.
7. Weather.
8. Minefields or contaminated areas.
9. Our own capabilities in combating

obstacles.

(b) Collect and evaluate the following data; evaluate to determine water terminal discharge (input) capacity:

1. Tactical dispersion requirements.
2. Wharf facilities.
3. Beach capabilities.
4. Discharge rates ashore.
5. Discharge rates astream.
6. Anchorage area.
7. Extent of destruction or contamination.

tion.

8. Climate and seasons.
9. Weather and tide characteristics.
10. Cargo-handling equipment available.
11. Floating craft and equipment available.
12. Transit sheds and areas.
13. Availability of indigenous labor.
14. Space reserved for local economy.
15. Enemy activity.

(c) Collect and evaluate the following data; add to determine water terminal clearance (output):

1. Capacity of rail facilities.
2. Capacity of highway facilities.
3. Capacity of inland waterway facilities.
4. Capacity of pipeline facilities.
5. Capacity of air facilities.
6. Enemy activity.
7. Capacity of receiving units capability

to receive.

¹To determine terminal reception capacity, collect and evaluate data items (a)1-9 plus data items (b)1, 6, 7, 9, 14, and 15. When wharf and beach facilities are used for the physical accommodations of ships, data items (b)2 and 3 should also be considered.

(d) Determine water terminal throughput capacity by combining (a), (b), and (c) above. The most restrictive factor normally determines or limits the capacity of the terminal.

Note. Some data probably can be obtained from Navy sources; information on beaches can be obtained from paragraph 6-6; and sections II through V contain capabilities of transport services.

c. Wharf Facilities.

(1) *General.* Because only two methods of dry cargo discharge are available (a(1) and (2) above), planners must consider wharf facilities for alongside and lighter discharge. The Victory-type ship having five hatches is used as a basis for all discharge because it so closely meets the average characteristics of a normal ship. Deep-draft wharfage must be provided whenever *alongside* discharge is contemplated. Shallow-draft wharfage and anchorage areas must be given joint consideration when lighter discharge is contemplated. Factors governing wharfage are in (2) and (3) below. The term "wharf" is used throughout in its general meaning, i.e., a structure used to aid in the berthing, loading, and discharge of a vessel. Specific definitions of ship berthing facilities follow:

(a) *Wharf* — A structure of timber, masonry, cement, earth, or other material built along or at an angle from the shore of navigable waters so that vessels may lie close alongside to receive and discharge cargo and passengers.

(b) *Quay* — A wharf parallel with the shoreline of a basin or harbor with water and accommodations for ships on one side only.

(c) *Pier* — A wharf that projects into the harbor or basin with water and accommodations for ships on both sides.

(2) *Deep draft wharf requirements.* A wharf is classified as deep draft when the water alongside is deep enough to permit a fully loaded deep draft ship to tie up alongside. The following criteria govern:

(a) Water depth should be not less than 10 meters at low tide. A minimum of 10 meters is used for planning purposes because it will accommodate virtually all deep-draft vessels.

(b) The length for Victory-type ship is 150 meters. Each hatch (five per vessel) requires 30 meters of wharf. When wharves are more than 150 meters' long and less than the next higher 150-meter unit, the odd footage is disregarded in determining the number of berths available (e.g., 360 meters will accommodate only two ships at the same time). However, the extra 60 meters can be considered for lighterage use ((3) below).

(c) Width should be from 18 to 27 meters

for discharge on only one side of wharf and 27 meters and more for discharge on both sides of wharf. For planning and estimating, a wharf should be from 18 to 27 meters' wide to allow sufficient working space to discharge cargo from a ship.

(3) *Lighterage wharf requirements.*

(a) *General.* Any wharf may be used for lighter discharge if the water depth is sufficient for the type of lighterage being used. It may include wharfage that dries out at low tide but that can be used half the time, or 10 hours per day.

(b) *Length for lighter.* Wharfage length for a lighter should be 30 meters. Length of wharfage more than 30 meters and less than the next higher 30-meter unit is disregarded (i.e., a 110-meter wharf will handle three lighters at the same time).

(c) *Width.* Width should be a minimum of 10 meters for discharge on one side and 13 meters for discharge on both sides of pier.

d. *Discharge Rates.*

(1) *Per ship berth (Victory type).* Seven hundred and twenty STON per 20-hour day (five hatches at 7.2 STON per hatch per hour).

(2) *Per lighter berth.* One hundred and eighty STON per 20-hour day (1.8 STON per linear foot or 5.9 tons per linear meter of wharf per 20-hour day).

(3) *Per roll-on/off berth (Comet style).* One thousand STON of cargo loaded in semitrailers per hour.

e. *Anchorage Areas.* Anchorage areas are defined as sheltered areas inside or near a harbor, unaffected by swell, where ships may anchor and discharge by lighter.

(1) *Depth.* The minimum depth (10 meters) is dictated by the draft of the ship and the maximum (65 meters) is dictated by the length and weight of the anchor chain. Installed facilities, such as mooring buoys, may modify maximum depth limitations.

(2) *Free-swinging anchorage area.* Two hundred and forty-five meters' radius circle.

(3) *Moored bow and stern.* Variable; this method is not preferred because it can be used only in areas unaffected by tidal currents.

f. *Estimate of Water Terminal Operating Personnel and Equipment.*

(1) *General.* To insure maximum efficiency in terminal operations, a balanced operating force and suitable equipment must be available. Extreme care must be exercised during the planning and operational phases to insure that a balance is established and maintained. The possibility of using civilian and prisoner of war labor should

not be overlooked, particularly in later expansion of the water terminal.

(2) *Operating personnel.* Operating personnel are divided into managing, or supervisory, elements (such as headquarters and headquarters company, terminal brigade and group) and functional operating units. In the latter category may be included terminal service companies or battalions, truck companies, engineer units, watercraft units, and such other units particularly suited for the functioning of any particular water terminal. Units commonly found in a water terminal follow:

(a) Headquarters and headquarters company, transportation terminal brigade (TOE 55-111).

(b) Headquarters and headquarters company, transportation terminal group (TOE 55-112).

(c) Headquarters and headquarters company, transportation terminal battalion (TOE 55-116).

(d) Transportation lighterage maintenance company, direct support (TOE 55-158).

(e) Transportation terminal service company (TOE 55-117).

(f) Transportation medium boat company (TOE 55-128).

(g) Transportation heavy boat company (TOE 55-129).

(h) Transportation light amphibian company (TOE 55-138).

(i) Transportation floating craft general support maintenance company (TOE 55-157).

(j) Headquarters and headquarters detachment, transportation motor transport battalion (TOE 55-16).

(k) Transportation light truck company (TOE 55-17).

(l) Transportation medium truck company (TOE 55-18).

(m) Transportation heavy truck company (TOE 55-28).

(n) Transportation terminal transfer company (TOE 55-118).

(o) Transportation medium amphibian company (TOE 55-139).

(p) Transportation medium amphibian company (TOE 55-140).

(q) Transportation watercraft teams (TOE 55-530).

(r) Headquarters and headquarters detachments, military police battalion (TOE 19-77).

(s) Engineer, construction, utilities, and electric power teams (TOE 5-530).

(t) Engineer firefighting team (TOE 5-510).

(u) Finance disbursing section (TOE 14-500).

(v) Medical dispensary team (TOE 8-500).

(w) Veterinary food inspection detachment (small) (TOE 8-500).

(x) Quartermaster service company (TOE 10-449).

(y) Signal service team (TOE 11-500).

(z) Army postal unit (TOE 12-605).

(aa) Ordnance ammunition team (TOE 9-500).

g. Operating Procedures and Equipment. FM 55-51, FM 55-52, FM 55-56, FM 55-57, and FM 55-58 contain details on operation and capacity of terminal operating equipment.

h. Illustrative Example of Water Terminal Capacity Estimation. The following example demonstrates the recommended procedure for water terminal capacity estimation based on the steps and data outlined in the preceding paragraphs.

(1) *Situation.* A true-scale chart (fig. 6-1) of a certain harbor has been prepared for evaluation. With reference to this chart, additional information is assembled in table 6-4.

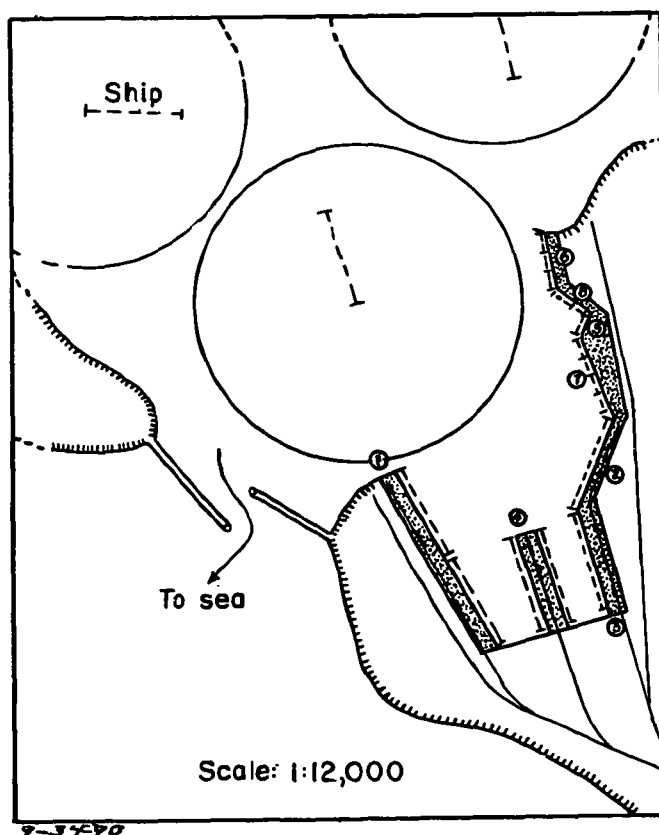


Figure 6-1. Typical harbor (drawn to scale).

Table 6-4. Water Terminal Description

	1	2	3	4
1	Wharf number	Length (m)	Width (m)	Minimum depth alongside at low tide (m)
2	1.....	323	24	10.0
3	2.....	149	18	10.0
4	3.....	177	27	10.0
5	4.....	163	31	10.0 (each side)
6	5.....	38	17	2.5
7	6.....	90	18	4.5
8	7.....	137	23	7.0
9	8.....	64	18	5.0

(a) There is sufficient area inside the harbor to anchor three ships as shown, where they can be worked continuously.

(b) In good weather, as many as two vessels can be anchored and worked outside the breakwater.

(2) *Problem.* To estimate the daily capacity of this terminal during ideal weather.

(3) *Solution.* (Tables 6-5 and 6-6.)

Table 6-5. Discharge Tonnage at Deep-Draft Wharfage

	1	2	3
1	Wharf number	Vessel that can be berthed	Rate of discharge in STON per day
2	1.....	2 Victorys.....	$2 \times 720 = 1,440$
3	2.....	1 Victory.....	$1 \times 720 = 720$
4	3.....	1 Victory.....	$1 \times 720 = 720$
5	4.....	2 Victorys.....	$2 \times 720 = 1,440$
6	Total.....		4,320

Table 6-6. Discharge Tonnage to Lighterage Wharves

	1	2	3
1	Wharf number	Lighter berths	Rate of discharge in STON per day
2	5.....	1	$1 \times 180 = 180$
3	6.....	3	$3 \times 180 = 540$
4	7.....	4	$4 \times 180 = 720$
5	8.....	2	$2 \times 180 = 360$
6	Total.....		1,800

(a) *Rate of discharge from ships at anchor to lighters.* From the situation three ships can be anchored inside the breakwater and two can be anchored and worked outside the breakwater in good weather. Therefore, in good weather, cargo can be discharged from ships to lighters at the rate of $(3 + 2) \times 720 = 3,600$ STON per day.

(b) *Resultant daily terminal capacity — summary.*

1. Discharged alongside deep-draft wharfs — 4,320 STON per day.

2. Discharged from lighters to wharf — 1,800 STON per day.

3. Transferred from ships to lighters — 3,600 STON per day.

4. Therefore, 1,800 STON per day is maximum discharge by lighter since lighter wharfage is the limiting factor in this case.

5. Total daily terminal capacity — 4,320 STON per day alongside 1,800 STON per day by lighter, for a total of 6,120 STON per day.

(c) *Limitations on terminal capacity.* Requirements for dispersion and limitations on the number of ships that can be grouped in one area may restrict the use of the facility to much less than its full capacity.

(4) *Effects of bad weather.* Advance study must be made to determine the probable effect of bad weather on rate of discharge and other factors in water terminal capacity. Continuous records of daily discharge plotted against weather and surf conditions prove valuable in planning future discharge in the same and similar water terminals.

(5) *Operating personnel and equipment.* Appropriate and sufficient operating personnel and equipment must be provided to use the capacities of the physical facilities of the terminal.

6-6. Water Terminals (Beaches)

a. Amphibious Operations.

(1) Beach capacity.

(a) Each landing in an amphibious operation differs as to climatic and hydrographic conditions and variations in topographic features and the military situation. Therefore, to develop detailed logistic planning data applicable only to beaches and their capacity to receive troops and cargo is impracticable. However, certain general planning data can be developed.

(b) Beach capacity is the amount of cargo that can be discharged over a given metric beach length within a stated time interval. During the initial phases of an amphibious operation, beach capacity is limited to the beach (or beaches) over which the assault landing is made; later, if necessary, overall capacity may be increased by the consolidation of beaches for more efficient operation and for the opening of sheltered unloading points in rivers or bays. Experience indicates that during the *assault* phase of an operation cargo can be landed and moved across beaches as follows (use either 1 or 2 or 1 and 2 together in proportionate combination):

1. Average STON of cargo per day per kilometer of beach — 1,860.

2. Average numbers of vehicles and personnel landed simultaneously per day per kilometer of beach — 410 vehicles and 2,930 personnel.

(2) *Requirements for ship unloading.* Facilities for unloading ships offshore usually are limited to the ships' organic gear. Using ships' organic gear, stevedore labor, and lighterage provided by the task force, cargo is discharged at a

Table 6-7. Characteristics of Small Landing Craft

Table 3-11. Characteristics of Small Landing Craft														
1	2	3	4	5	6		8	9	10	11	12	13	14	
Line item number	Name	Symbol	Length	Beam	Capacity		Draft (loaded)		Speed loaded (kmph)	Range (km)	Crew	Weight empty (LTON)	Cargo space dimensions	
					Troops or Cargo (number)	(LTON)	Forward	Aft						
2	L36602	Landing craft, mechanized (Mark VI).	LCM(6)	56 ft	14 ft	120	32.0	3 ft	4 ft 8 in.	14.8	206 at 14.8 kmph	4	28	38 ft by 9 ft 6 in. by 6 ft 4 in.
3	L36739	Landing craft, mechanized (Mark VIII).	LCM(8)	73 ft 6 in.	21 ft	200	53.5	3 ft	5 ft	18.5	457	6	60	37 ft 8 in. by 14 ft 5 in. by 3 ft 8 in.
4	L36876	Landing craft, utility (1466 class).	LCU	115 ft 1 in.	34 ft	300	135.0	3 ft 1 in.	4 ft	13.0	1,120	12	180	52 ft by 29 ft 6 in. by 4 ft 6 in. 22 ft by 14 ft 4 in. by 4 ft 6 in.
5	L36945	Landing craft, vehicle, personnel.	LCVP	36 ft	10 ft	36	3.5	2 ft 2 in.	3 ft	19.5	217	4	8	17 ft 3 in. by 7 ft 5 in. by 5 ft.

Table 6-8. Characteristics of Amphibious Vehicles

1	2	3	4	5	6	7	8	9	10	11	12	13	14	
1	Line item number	Name	Symbol	Length	Beam	Capacity		Speed		Range		Crew	Weight empty (LTON)	Example of material carried
						Troops or Cargo (number)	(LTON)	Land (kmph)	Water (kmph)	Land (km)	Water (km)			
2	D10990	Carrier, cargo, full-tracked, amphibious.	M116	15 ft 7 in.	6 ft 10 in.	13	1.34	59.5	7.4	482	35.4	1	3.52	14 passengers (including crew). None.
3	L37030	Landing vehicle, tracked, engineer, model 1.	LVTE-1	39 ft 9¼ in.	12 ft 8½ in.	-----	-----	40.0	10.0	640	128.1	7	36.90	
4	L37118	Landing vehicle, tracked (Mark V).	LVTP-5	29 ft 8 in.	11 ft 8½ in.	34 (land) 25 (water)	8.05 (land) 5.35 (water)	48.2	12.9	306	91.7	3	31.20	105-mm howitzer with crew and 100 rounds of ammunition.
5	L37132	Landing vehicle, tracked, recovery, model 1.	LVTR-1	31 ft 9 in.	11 ft 8½ in.	-----	-----	48.2	12.6	306	105.6	3	33.50	600 cu ft available with recovery equipment removed from cargo compartment.
6	-----	Landing vehicle, tracked.	LVT(A)-5	27 ft 2½ in.	10 ft 10 in.	-----	-----	32.2	10.4	241	92.7	5	15.70	None.
7	-----	Landing vehicle, tracked (Mark XI).	LVTH-6	21 ft 8 in.	11 ft 8½ in.	-----	-----	44.7	11.3	201	83.4	5	37.80	None.
8	-----	Landing vehicle, tracked (Mark VI).	LVTP-6	21 ft 7 in.	10 ft 9 in.	20	-----	48.2	10.2	201	83.4	3	17.90	Bulk cargo.
9	L67234	Lighter, amphibious, wheeled (LARC-5).	LARC-5	35 ft	10 ft	0 (20)	4.40 (4.50)	40.2	18.5	257	120.5	2	72.20	Unitized cargo.
10	L67371	Lighter, amphibious, wheeled (LARC-15).	LARC-15	45 ft	12 ft 6 in.	0 (50)	13.40	32.2	18.0	121	51.9	2	19.00	1 loaded 2½-ton truck or 10 palletized units.
11	L67508	Lighter, amphibious, wheeled (LARC-60).	LARC-60	62 ft 6¾ in.	26 ft 7 in.	125 (200)	53.60 (89.30)	22.5	13.0	338	194.6	8	87.00	Heavy, bulky equipment.

*Figures in parentheses in columns 6 and 7 denote emergency capacity.

Note. No consideration need be given to the draft of amphibious vehicles. However, consideration must be given to the characteristics of the landing area that may affect beaching, such as mud, coral or rock formations.

Table 6-9. Characteristics of Landing Ships

	1	2	3	4	5	6	7	8	9	10	11	12
1	Name	Number of ships in class	Type	Operational range (nautical Miles)	Cargo capacity (LTON)	Troop capacity ^a	Cargo space (sq ft)	Loaded draft		Length	Boat capacity	Typical loads
								Beaching	Oceangoing			
2	LSD (1)-----	26	Flooded well deck.	13,000	1,233-----	226	17,316	27 ft (flooded)	18 ft dry	458 ft	2 LCVP and 1 LCPL	3 LCU and 4-5 mdm trk; or 18 LCM (6) and 30 LTON cargo; or 41 LVT; or 27 LCVP; or 44 M48 tk.
3	LSD (28)----	1	Flooded well deck.	13,000	2,410-----	353	19,800	30 ft (flooded)	19 ft dry	510 ft	3 LCVP and 1 LCPL	(With two temporary decks with ramps) 92 LVT.
4	LSD (32)----	4	Flooded well deck.	9,500	2,500 in addition to rated well-deck load.	313	24,792	33 ft 9 in. (flooded)	19 ft dry	510 ft 10 in.	3 LCVP and 1 LCPL	3 LCU; or 20 LCM (6); or 9 LCM (8); or 49 LVTP-5; or 87 LVTP-6.
5	LST (1156)--	15	Ramp, 50-ton capacity.	6,000	Normal—446; Maximum landing—803; Full—1,395.	395	14,000 (vehicles), 16,500 (cargo)	4 ft 11 in. fwd 10 ft 8 in. aft	8 ft 3 in. in fwd.	382 ft	3 LCVP and 1 LCPL	80 2½-ton trk, 450 LTON cargo; or 144 ¾-ton trk, 415 LTON cargo; or 233 ¼-ton trk, 530 LTON cargo; or 25 LARC-5, 445 LTON cargo.
6	LST (1153)--	2	Steamdriven; ramp, 50-ton capacity.	7,700	Normal—446; Maximum landing—803; Full—2,060.	197	14,340	33 ft 11 in. fwd 11 ft 11 in. aft.	9 ft 6 in. fwd 16 ft 3 in. aft.	382 ft	4 LCVP or 4 LCPR	21 LVT and 35 2½-ton trk; or 25 LARC-5; or 226,000 gal gasoline and 70,000 gal diesel fuel.
7	LST (542)---	148	Ramp, 50-ton capacity.	7,706	Normal—446; Maximum beaching—803; Full—1,212	141	4,556 (vehicles); 9,772 (cargo)	5 ft 3 in. fwd 10 ft aft.	7 ft. 2 in. fwd 13 ft aft.	385 ft	4 LCVP or 4 LCPR	26 2½-ton trk, 650 LTON cargo; or 45 ¾-ton trk, 675 LTON cargo; or 75 ¼-ton trk, 710 LTON cargo; or 23 LARC-5.
8	LST (1171)--	8	Ramp, 75-ton capacity (equipped with turntable).	6,048	Normal—500; Maximum landing—900; Full—1,850.	634	18,313	4 ft fwd 13 ft aft.	9 ft 9 in. fwd 16 ft aft.	442 ft	3 LCVP and 1 LCPL	19 LVTP-5 and CH-19 hel; or 27 LVTP-6 and 5 CH-19 hel; or 69 2½-ton trk; or 42 2½-ton trk with 1 ½-ton tlr; or M48 tk.

See footnotes at end of table.

Table 6-9—Continued

Table 6-5—Continued												
	1	2	3	4	5	6	7	8	9	10	11	12
1	Name	Number of ships in class	Type	Operational range (nautical Miles)	Cargo capacity (LTON)	Troop capacity ^a	Cargo space (sq ft)	Loaded draft		Length	Boat capacity	Typical loads
								Beaching	Oceangoing			
9	LSM-----	136	Ramp, open well.	10,000	Landing— 147; Full— 446	56	2,900	3 ft 6 in. fwd 7 ft 1 in. aft.	6 ft 4 ½ in. fwd 8 ft 5 in. aft.	204 ft-----		3 M48 tanks; or 5 LVT.

^a Troop capacity may be increased by berthing troops on decks. Troops must provide own feeding facilities.

^b Add 6,336 sq ft with mezzanine deck installed.

Note 1. A boat space is the space weight allowed one soldier with his individual combat equipment. It is 224 lb or 13.5 cu ft. When computing boat spaces required for cargo, use either the weight or the space occupied whichever is greater. Hand carts, loaded or empty, require two boat spaces.

Note 2. Running time may be computed from the formula $T = \frac{3D}{S}$ when D = distance run in hundreds of yards.
 S = speed in knots (1 ½ mph).
 T = running time in minutes.

Table 6-10. Characteristics of Transport Type Vessels

Table 3-10. Characteristics of Transport Type Vessels											
	1	2	3	4	5	6	7	8	9	10	11
1	Name	Number ships in class	Class	Type	Length	Loaded draft	Troop capacity	Cargo capacity (LTON)	Cargo space	Boat capacity	Cruising range (nautical miles)
2	Amphibious force flagship (AGC)---	16	-----	C-2	459 ft---	24 ft-----				2 LCVP 4 LCPL 2 LCPR	30,000
3	Attack transport (APA 117)-----	57	Haskell-----		455 ft---	24 ft----	1,565	446.0	13,000 sq ft----- 110,000 cu ft-----	2 LCM(6) 22 LCVP 1 LCPL 1 LCPR	9,000
4	Attack transport (APA 33)-----	6	Bayfield-----		492 ft---	27 ft----	1,647	446.0	15,000 sq ft----- 160,000 cu ft-----	4 LCM(6) 18 LCVP 3 LCPL 2 LCPR	11,630
5	Attack cargo ship (AKA)-----	35	Montague--	C-2A---	459 ft---	24 ft----	212	1335.0- 1600.0	31,858 sq ft----- 291,706 cu ft-----	6 LCM(6) 14 LCVP 1 LCPL 1 LCPR 2 LCM(3)	12,000
6	High-speed transport (APD)-----	21	-----	EX-DDE	306 ft---	13 ft----	156	45.0	3,730 cu ft-----	2 LCVP 2 LCPR or 2 LCPL	5,100
7	Transport submarine (A-SSP)-----	2	Sea Lion-----		312 ft-----		85	26.7-----		20 rubber landing craft.	
8	Roll-on/roll-off vehicle ship (T-AK)	1	Comet-----	C-4	449 ft---	22 ft-----		4000.0 (375 veh)	60,000 sq ft parking space and 176,500 cu ft cargo space.		13,000
9	Amphibious assault ship (LPH)----	13	-----	EX-CVE	88 ft---	28 ft 9¼ in.	1,500				16,000

prescribed rate in planned sequence. The use of balanced amounts of conventional and amphibious ship-to-shore lighterage, combined with planned and controlled ship discharge, reduces beach congestion to a minimum.

(3) *Characteristics of amphibious force vessels and craft.* (Tables 6-7 through 6-10.)

(a) Data in this subparagraph with reference to speed and endurance may vary under operational conditions. For the most recent data, consult FM 5-144, FM 5-15, and FM 60-30 and SB 700-20.

(b) Designating letters and names are used as follows:

1. LC (landing craft) is applied to non-oceangoing vessels of less than 60 meters' overall length designed for landing operations.

2. LS (landing ship) is applied to oceangoing vessels of more than 60 meters' overall length designed for participation in landing operations.

3. LV (landing vehicle) is applied to small equipment designed for landing operations and capable of use on land or water.

(4) *Cargo movement by wheeled amphibians.* In amphibious operations, wheeled amphibians are specialized equipment of exceptional value that enable direct movement of cargo from ships to shore-based dumps or transfer points.

(5) *Equipment required for operations on the beach, for beach clearance, and for operations in shore-based dumps.* Experience consistently shows a lack of sufficient shore-based equipment to receive cargo as rapidly as unloading from ships can be accomplished. Resulting bottlenecks at beaches and at beach dumps can be avoided with the addition of cargo-handling equipment, particularly cranes and forklifts. Cargo-handling equipment best adapted to beach and shore-dump employment include cranes, tractors, and trucks. Detailed characteristics of these items are outlined below.

(a) Cranes should be self-propelled, of medium and heavy types, with booms 40 feet in length to permit lifting filled cargo nets. Each crane can handle discharge from three landing craft, utility (LCU), eight landing craft, mechanized (LCM), and 12 landing craft, vehicle, personnel (LCVP) under normal beach operations when sufficient trucks or tractors are available to haul or drag away unloaded cargo.

(b) Medium and heavy tractors can tow up to nine loaded sled pallets. This type of movement from beach to dump is slow and less satisfactory than movement by truck. However, for dragging pallets from landing craft and within

supply dumps, tractors are effective. Tractors are invaluable for clearing the beach and dump areas of mired vehicles. From eight to 10 tractors per assault division, with six or seven on beaches and two or three in supply dumps, are usually sufficient. Several tractors assigned to a beach should be equipped with angledozer.

(c) Paragraph 6-37 through 6-40 apply to trucks.

(6) *Beach service troop requirements.* Service troops are employed throughout the supply service cycle from ship unloading to segregation and storage of supplies in shore-based dumps. The multiple functions performed in this cycle require careful balancing of the types of troops employed.

b. *Logistics-Over-The-Shore Operations.*

(1) *General.* In situations other than amphibious operations, a logistics-over-the-shore operation (LOTS) provides for the movement of cargo across the shore between ocean transportation and shoreside facilities. Beaches and other more difficult shoreline are used during this type of operation commensurate with the situation.

(2) *Beach capacity estimation.* The checklist in paragraph 6-5b(2) may be used in determining the beach capacity. Certain of these factors are not primary considerations; others must be expanded according to the location under study, which determines the weight to be given each individual factor. The following items must be investigated thoroughly to determine their effect on the operation:

(a) Weather — wind, fog, rainfall, temperature.

(b) Sea area — extent, depth of water, type of bottom, vulnerability to sea-wave action.

(c) Beach approaches — reefs, bars, man-made obstacles, tide, type of bottom, surf conditions, underwater gradient.

(d) Beach — gradient, composition, length, width, wave effect, exits.

(e) Hinterland — depth, concealment, transportation net capability.

(3) *Operating equipment.* The same materials handling functions as those in a conventional port situation are performed, but more cranes and forklift trucks that can traverse sand and soft terrain are required. Amphibians should be used to relieve congestion at the water's edge and to eliminate unnecessary handling of cargo.

6-7. Inland Terminals

a. *Definition.* Inland terminals are those inland transit points where cargo is —

(1) Temporarily held intransit awaiting disposition instructions.

(2) Transferred from one means of transportation to another.

(3) Broken down from bulk shipments and reshipped in small units.

(4) Collected from other points to make a transportation unit for reshipment.

b. Capacity Estimation. Inland terminal capacity is the total tonnage that can be *received, processed, and cleared* through the terminal in any 1 day. The terminal capacity is estimated by analyzing three major factors—reception capacity, loading and unloading or transfer capacity, and clearance capacity—to ascertain which is the limiting factor and determining the capacity as expressed in daily tonnage. The following is a checklist for estimation of inland terminal capacity:

(1) Collect these data when applicable; evaluate to determine inland terminal reception capacity:

- (a) Channel depths.
- (b) Obstructions.
- (c) Capacity of rail facilities.
- (d) Capacity of highway facilities.
- (e) Capacity of pipeline facilities.
- (f) Capacity of air facilities.
- (g) Enemy air activity.
- (h) Enemy surface activity.
- (i) Climate.
- (j) Weather.
- (k) Contaminated areas.
- (l) Our own capabilities in combating obstacles.

(2) Collect these data when applicable; evaluate to determine loading and/or transfer capacity:

- (a) Tactical dispersion requirements.
- (b) Wharf and/or platform facilities.
- (c) Discharge rates.
- (d) Unloading rates.
- (e) Loading rates.
- (f) Extent of destruction or contamination.
- (g) Climate and seasons.
- (h) Weather and tide characteristics.
- (i) Materials handling equipment available.
- (j) Cargo-handling equipment available.
- (k) Floating craft and equipment available.
- (l) Airfield capabilities.
- (m) Transit shed, yards, and areas.
- (n) Indigenous labor available.
- (o) Space reserved for local economy.

(3) Collect these data when applicable; add to determine clearance capacity:

- (a) Capacity of rail facilities.
- (b) Capacity of highway facilities.
- (c) Capacity of inland waterway facilities.
- (d) Capacity of pipeline facilities.
- (e) Capacity of air facilities.
- (f) Capacity of receiving unit's capability to receive.

(4) Determine inland terminal capacity by combining the factors of (1), (2), and (3) above. The most restrictive factor normally determines or limits the capacity of the terminal.

c. Estimation of Equipment. Equipment requirements are determined by analyzing the projected workload of the inland terminal in relation to the tonnages and types of cargo to be unloaded, loaded, and transferred.

d. Estimation of Personnel Requirements. Personnel requirements are determined by evaluating the mission of the inland terminal in terms of workload, equipment to be manned, and services to be performed. To insure maximum efficiency in terminal operation, a balanced force and supervisory elements must be available. The use of indigenous and prisoner of war labor should be considered.

6-8. Types and Characteristics of Inland Waterways

a. Types. Inland waterways include all navigable inland waters, such as rivers, lakes, inland channels, and canals, of sufficient depth to accommodate cargo traffic. The following are the general types into which inland waterways are grouped:

- (1) Lakes.
- (2) Rivers.
- (3) Ship canals.
- (4) Barge canals.
- (5) Intracoastal waterways.

b. Characteristics. The characteristics of a waterway that must be considered in an analysis of its capabilities follow:

- (1) Restricting widths and depths of channel.
- (2) Vertical and horizontal bridge clearance.
- (3) Location of dams and other bars to navigation.
- (4) Location of locks, dimensions, and timing.
- (5) Seasonal floods and droughts, their frequency, and their duration.
- (6) Normal freezeup and opening dates.

- (7) Hazards to navigation, such as rapids and falls.
- (8) Speed and fluctuation of current.
- (9) Waterway maintenance requirements.
- (10) Changes of channel.

6-9. Waterway Capacity Estimates

a. Limiting Factors. Factors, other than waterway characteristics, having a limited effect on waterway capacity are —

- (1) Availability of suitable barges or craft.
- (2) Availability of suitable operating personnel.
- (3) Availability and adequacy of terminals and terminal facilities.

b. Turnaround Time. This factor is defined as the time required for a barge or craft to load, travel to destination, unload, return to origin, and be ready to resume loading. It has considerable effect on waterway capacity and involves —

- (1) Length of haul, taken as round-trip distance.
- (2) Speed in still water — 6 kilometers per hour.
- (3) Speed and direction of current.
- (4) Loading and unloading time — computed at 8.4 STON per barge per hour.
- (5) Time consumed in locks.
- (6) Operating hours per day — normally 20, allocating the remaining 4 for maintenance, refueling, restoring, etc.

c. Capacity Determination, Craft Available to Fill or Exceed Waterway Capacity. When sufficient barges or craft are available to fill or exceed waterway capacity, the daily tonnage that may be moved over the waterway is equal to one-half the number of craft per day that can be passed through the most limiting constriction (e.g., a lock, lift bridge, narrow channel) times the average net capability of the craft in use.

d. Capacity Determination, Craft Not Available to Fill or Exceed Waterway Capacity. The following formula may be used to determine the number of tons a given number of barges can transport a given distance daily:

$$\frac{\text{Number of barges} \times \text{tons per barge} \times \text{hours of operation per day}}{\text{turnaround time in hours}} = \text{tons moved daily}$$

Example: Determine the daily tonnage that 20 barges of 270 STON capacity each can move 90 kilometers forward with no lost time in locks and negligible effect due to current —

$$\text{Travel time per barge} = \frac{90 + 90}{6} = 30 \text{ hours}$$

$$\text{Loading and unloading time per barge} = \frac{2 \times 270}{8.4} = 64.3 \text{ hours}$$

$$\begin{aligned} \text{Turnaround time per barge} &= 30 + 64.3 \times 94.3 \text{ hours} \\ &= 20 \text{ barges} \times 270 \text{ tons per barge} \\ &\quad \times 20 \text{ hours' daily availability} \\ &\quad \div 94.3 \text{ hours' turnaround time} = 1,145.3 \text{ STON daily} \end{aligned}$$

6-10. Floating Equipment Requirements

a. Cargo Craft. To determine the number of barges or cargo craft required to move a given tonnage a given distance forward daily, use the following formula:

$$\frac{\text{Daily tonnage} \times \text{hours' turnaround time}}{\text{Tons per barge} \times \text{hours of operation daily}} = \text{number of barges required}$$

Example: Determine the number of barges having a capacity of 500 STON required to move 1,000 STON daily a distance of 150 kilometers forward, assuming no lost time in locks and negligible effect due to current.

$$\text{Travel time per barge} = \frac{150 + 150}{6} = 50 \text{ hours}$$

$$\text{Loading and unloading time per barge} = \frac{2 \times 500}{8.4} = 119 \text{ hours}$$

$$\text{Turnaround time per barge} = 50 + 119 = 169 \text{ hours}$$

$$\frac{1,000 \text{ tons daily} \times 169 \text{ hours' turnaround}}{500 \text{ tons per barge} \times 20 \text{ hours' daily operation}} = \frac{16.9 \text{ barges}}{17 \text{ barges required}}$$

b. Tugs and Tugboats. Since a single tug or towboat can normally be used to tow more than one barge and since loading time is not a consideration in tug or tow boat availability, then fewer tugs than barges will be required in any given situation. To determine the number of tugs or towboats required to operate a given number of barges in a given situation, use the following formula:

$$\frac{\text{Total number of barges} \times \text{turnaround time for tugs in days}}{\text{number of barges per tow} \times \text{turnaround time for barges in days}} = \text{number of tugs}$$

Example: Determine the number of tugs required to operate 400 barges, when each tow consists of five barges, turnaround time for barges is 4 days, and turnaround time for tugs is 2 days.

$$\frac{400 \text{ barges} \times 2 \text{ days' tug turnaround}}{5 \text{ barges per tow} \times 4 \text{ days' barge turnaround}} = 40 \text{ tugs required}$$

6-11. Definition of Ship-Loading Terms

a. Units of Weight.

(1) STON — 2,000 pounds. Used by U.S. ships in domestic trade.

(2) LTON — 2,240 pounds. Used by U.S. ships in foreign trade.

(3) Metric ton — 2,205 pounds. Used by foreign shipping.

b. Units of Volume.

(1) Measurement ton (MTON) — 40 cubic feet. Used by U.S. ships in foreign trade.

(2) Register ton—100 cubic feet. (This tonnage is used for working out a basis to collect entry fees for the vessel and has no direct bearing on the cargo-carrying capacity of the vessel.)

c. Units of Distance and Speed.

(1) Distance (nautical mile)—6,076 feet.

(2) Speed (knot)—1 nautical mile per hour.

d. Gross Tonnage. Gross tonnage (gross register tonnage) is the entire internal cubic capacity of a ship expressed in register tons of 100 cubic feet each.

e. Net Tonnage. Net tonnage (net register tonnage) of a ship represents the cargo and passenger-earning spaces that remain after deduction from the gross tonnage of space for the crew, powerplant, fuel, and operation of the vessel. Net tonnage is expressed in tons of 100 cubic feet each.

f. Deadweight Tonnage. Deadweight tonnage is the carrying capacity of a ship expressed in LTON and represents the difference between displacement loaded to maximum draft allowed by law and displacement light.

g. Displacement Tonnage Light. Displacement tonnage light is the weight of a ship in LTON and excludes the weight of cargo, passengers, fuel, water, stores, dunnage, and such other items necessary for use on a voyage.

h. Displacement Tonnage Loaded. Displacement tonnage loaded is the weight of a ship in LTON and includes the weight of cargo, passengers, fuel, water, stores, dunnage, and such other items necessary for use on a voyage.

i. Cargo Deadweight Tonnage. Cargo deadweight tonnage is the weightlifting capacity of a ship in LTON remaining after deducting from the deadweight tonnage the weight of fuel, water, stores, dunnage, and such other items as may be necessary for a voyage.

j. Grain Cubic Capacity. Grain cubic capacity is the maximum space available for cargo measured in cubic feet. The measurements are taken to the inside of the shell plating of the ship or to the outside of the frames and to the top of the beams or underside of the deck plating. If a bulk cargo of grain is loaded, the grain flows in between the frames and beams and occupies the maximum space available. This is the grain cubic capacity.

k. Bale Cubic Capacity. Bale cubic capacity of a ship is the number of cubic feet of space available for cargo measured to the inside of the cargo battens, on the frames, and to the underside of the beams.

l. Lost Space. Lost space (broken stowage,

stowage loss) is that cubic capacity of the ship which is not usable because of the configuration of the cargo and/or the ship. Although allowance for lost space varies substantially with individual types of cargo, the average allowance for the entire spread of military cargo amounts to the following, which is given in percentage of bale cubic capacity:

	Percentage
Administrative loading.....	20.
Commodity loading.....	30.
Combat loading.....	50.
Selective loading.....	30.

m. Stowage Factor. A stowage factor is a relationship of cubage to weight. As applied to cargo, it is the ratio of the number of cubic feet of space occupied by the cargo to the weight of the cargo in LTON. The units in which a stowage factor is expressed are "cubic feet per LTON." In individual items or types of cargo, the stowage factor is the amount of cubic feet of space occupied by 1 LTON.

n. Vessel Stowage Factor. Vessel stowage factor = (bale cubic capacity – estimated lost space) + (cargo deadweight tonnage – estimated weight of deck cargo).

(1) To determine whether weight or volume of a specific commodity will be the limiting factor in loading a Liberty-type ship of 400,000-cubic-foot capacity after deducting lost space and with a cargo capacity tonnage (less deckload) of 8,000 LTON:

$$\text{Vessel factor} = \frac{400,000 \text{ cubic feet}}{8,000 \text{ LTON}} = 50 \text{ cubic feet/LTON}$$

(2) Under the conditions stated above, the vessel will have its cargo space completely filled and its weight capacity used if stowed with cargo occupying 50 cubic feet to the LTON. In this example, for cargo occupying more than 50 cubic feet per LTON, volume will be the limiting factor. For cargo occupying less than 50 cubic feet per LTON, weight will be the limiting factor.

6-12. Commercial Loading Methods

a. Bulk and General Cargo Loading. Bulk and general cargo loading is the stowage of supplies to use the entire carrying capacity of a ship, disregarding segregation of cargoes either by class, technical service, or commodity. It permits maximum economy in shipping space, but requires additional labor and facilities at destination for segregation and assembly of supplies for use.

b. Multiple Port Discharge. Multiple port discharge uses bulk stowage of supplies for more than one destination, loaded to maintain availa-

bility for discharge of proper items in the order of arrival at the ship's scheduled destinations.

6-13. Military Loading Methods

Military cargo is loaded on board ships according to its intended employment at its destination. There are four distinct types of military loading.

a. Combat Loading. Combat loading gives primary consideration to the facility with which troops, equipment, and supplies can be unloaded and ready for combat on landing rather than to economical utilization of ship space. There are three methods of combat loading. They differ mainly as to the degree of availability of troop units for landing and as to the tactical integrity of the units.

(1) *Combat unit loading.* Combat unit loading is the loading of an assault troop unit, together with its essential combat equipment and supplies, in a single ship so that the unit will be available to support the tactical plan on debarkation and to provide maximum flexibility to meet possible changes in the tactical plan.

(2) *Combat organizational loading.* Combat organizational loading is the loading of a troop unit with its equipment and supplies on the same ship so as to be available for unloading in a predetermined order. It permits debarkation of complete units and equipment, which are available for employment after assembly ashore. This method is more economical in ship space than combat unit loading.

(3) *Combat spread loading.* Combat spread loading is the loading of some of the troops, equipment, and initial supplies of a unit on one ship and the remainder on one or more ships. This method is commonly used with troop units with heavy equipment. Units so loaded are available for employment at established beachheads or ports after a lapse of time necessary to assemble them on land with their equipment and supplies.

b. Administrative Loading. Administrative loading is a method of loading troops and/or equipment and supplies in a ship for maximum utilization of personnel and cargo space. No con-

sideration is given to debarkation priorities. Therefore, equipment and supplies must be unloaded and sorted before they can be used. This type of loading may be employed effectively for reinforcing and maintaining an expeditionary force and for carrying supplies and equipment for the buildup forces.

c. Commodity Loading. Commodity loading is a method of loading in which various types of cargo, such as ammunition, rations, or boxed vehicles, are loaded together so that each commodity can be discharged without disturbing the others.

d. Selective Loading. Selective loading is the arrangement and stowage of equipment and supplies aboard a ship in a manner designed to facilitate issue to units. Specific items may be discharged on call.

6-14. Nomenclature of Maritime Administration Oceangoing Vessels and Characteristics of Cargo Vessels

a. General. There is such a large variance in the cubic-carrying capacity of vessels of the same type, because of various alterations and special fittings, that the cubic feet and tonnage figures shown in tables 6-11 through 6-18 are, in most instances, minimum and apply to only one type of the designated vessels.

b. Nomenclature of Vessels. Table 6-11 provides nomenclature of cargo vessels and includes deadweight tonnage figures and a brief description of each vessel.

c. Cargo Vessel Characteristics. Tables 6-12 through 6-18 provide data on the characteristics of cargo vessels, to include physical characteristics, capacities, and deadweight tonnage figures. The five types of ships shown in tables 6-16 through 6-18 comprise the majority of all shipping available for military use. Note that the ships' capacities are expressed in LTON to conform with normal shipping procedures, whereas the discharge and loading capabilities of transportation terminal service companies are expressed in STON to conform with practices of other means of transportation.

Table 6-11. *Nomenclature of Vessels*

1	2	3	4
Type	DWT (M)	Class	Remarks
<i>Dry cargo</i>			
2 C1-A	8.0	AK	Designed for general cargo in world trade; steam-turbine and diesel propelled (two modifications).
3 C1-B	9.3	AK	Designed for general cargo in world trade; steam-turbine propelled (three modifications).
4 C1-M	6.0	AK	Designed for general cargo in coastal and inland waters; diesel propelled.
5 C2	10.5	AK	Designed for general cargo in world trade; steam-turbine propelled (several modifications). Modified types were used mostly as hospital ships in World War II.
6 C2-S	10.8	AK	Designed for general cargo in world trade; steam-turbine propelled (several modified types).
7 C3	12.3	AK	Principally designed as a cargo ship, can accommodate limited number of passengers; steam-turbine propelled (several modified types).
8 C3-S	13.0	AK	Designed for cargo; steam-turbine propelled.
9 C4	15.4	AK	Designed for cargo; steam-turbine propelled (two modifications).
10 C4-S	9.2- 11.3	AK	Mariner class vessel, developed by Maritime Administration in cooperation with the Department of Defense to provide modern high speed commercial-type vessels that can be readily converted for wartime shipping.
11 C5	24.4	AKD	Designed to carry bulk cargo (ore, grain, phosphate, etc.) in world trade; steam turbine propelled.
12 EC2 (ZEC#)	10.7	AK, APM, AKV	Liberty type designed for general cargo; steam-reciprocating engine propelled. Several modified types, prefixed by the symbol Z, were designated as tank carriers and later modified as aircraft carriers.
13 T-ARVH-1	10.8	AV	Converted Navy seaplane tender for a floating aircraft maintenance facility (FAMF). Capable of limited supply support, designed for the maintenance of light Army aircraft at sea or in port.
14 N3	2.8	AK	Cargo carrier designed for coastal trade; steam-reciprocating engine propelled.
15 VC2	10.8	AK	Victory type designed to carry cargo in world trade. Four types: one has 6,000 hp engine, three have 8,500 hp engines. Three are steam-turbine propelled; one is diesel propelled.
<i>Reefer cargo</i>			
16 C1-M	4.7	AF	Designed as a refrigerated cargo vessel; deisel propelled.
17 C2-SU	8.6	AF	Designed as a refrigerated cargo vessel; diesel propelled.
18 R1	5.2	AF	Designed as a refrigerated cargo vessel; diesel propelled.
19 R1-D	5.0	AF	Designed as a refrigerated cargo vessel; steam-turbine propelled.
20 R2-A	6.1	AF	Designed as a refrigerated cargo vessel; steam-turbine propelled.
21 R2-B	7.0	AF	Designed as a refrigerated cargo vessel; steam-turbine propelled.
<i>Combined passenger-cargo and transport</i>			
22 C2-A4	9.7	AP	Designed to carry troops and cargo; steam-turbine propelled.
23 C3-P	9.6	AP	Designed to carry troops and cargo; steam-turbine propelled.
24 C4-P1	6.1	AP	Designed to carry troops and cargo; steam-turbine propelled.
25 C449	9.4	AP	Designed to carry troops and cargo; steam-turbine propelled.
26 P2	10.2	AP	Designed to carry troops and cargo; two types; one turbo-electric
<i>Tankers</i>			
27 T1	1.5	AO	Designed for gasoline tanker service in coastal and inland waters; diesel propelled (four modifications).
28 T1-B2	3.9	AO	Designed to carry bulk oil in coastal and inland waters; diesel propelled.
29 T2-E	16.6	AO	Designed to carry bulk oil in world trade; turbo-electric propelled (four modifications).
30 ST2-F	16.4	AO	Designed to carry bulk oil in world trade; turbo-electric propelled.
31 T3	16.6	AO	Designed to carry bulk oil in world trade; steam turbine propelled (six modifications).
32 T5	26.6	AO	Designed to carry bulk oil in world trade; steam turbine propelled.

Table 6-12. *Physical Characteristics of Vessels*

1	2	3	4	5	6	7
Vessels	Gross register tonnage	Length (m) (ft)	Beam (ft)	Sustained speed (knots)	Cruising range (M nautical miles)	Draft (m) (ft)
<i>Dry cargo</i>						
2 C1-A	7,002	125 (412)	60	14.0	17	7.5 (25)
3 C1-B	6,711	127 (418)	60	14.0	16	8.5 (28)
4 C1-M	3,805	103 (339)	50	10.5	10	7.0 (23)
5 C2	6,132	140 (459)	63	15.5	16	8.1 (27)
6 C2-S	8,258	140 (459)	63	15.5	17-22	8.5 (28)
7 C3	7,950	150 (492)	70	16.5	12	8.8 (29)
8 C3-S	9,827	154 (506)	73	16.6-18.5	12-18	9.4 (31)
9 C4	10,800	158 (520)	72	17.0	11	10.0 (33)
10 C4-S	11,309	174 (572)	81	17.0-21.0	11-19	10.0 (33)
11 C5	8,561	178 (583)	78	16.0	11	10.3 (34)

Table 6-12—Continued

1	2	3	4	5	6	7
Vessels	Gross register tonnage	Length (m) (ft)	Beam (ft)	Sustained speed (knots)	Cruising range (M nautical miles)	Draft (m) (ft)
12 EC2.....	7,176	139 (455)	62	11.0	10 ^a	8.5 (28)
13 T-ARVH-1.....	1,124	135 (442)	57	18.0	9	7.0 (23)
14 FS ^b	560	54 (176)	32	12.0	4	3.6 (12)
15 N3.....	2,500	83 (271)	43	10.0	20	6.6 (21)
16 VC2.....	7,612	135 (442)	57	15.5	24	8.8 (29)
<i>Reefer cargo</i>						
17 C1-M.....	3,805	103 (339)	50	10.5	10	7.0 (23)
18 C2-SU.....	8,591	145 (474)	63	16.5	23	8.1 (27)
19 R1.....	3,770	103 (339)	50	10.5	10	7.0 (23)
20 R1-D.....	5,075	118 (386)	56	16.0	11	7.9 (26)
21 R2-A.....	7,074	139 (455)	61	18.5	7	8.1 (27)
22 R2-B.....	8,191	140 (460)	63	15.5	16	7.9 (26)
<i>Combined passenger-cargo and transports</i>						
23 C2A4.....	8,357	140 (459)	63	15.5	12	8.5 (28)
24 C3P.....	10,073	142 (495)	70	16.6	14	8.5 (28)
25 C4P1.....	12,500	159 (523)	72	17.0	15	7.9 (26)
26 C449.....	11,212	167 (547)	79	20.0	—	8.8 (29)
27 P2.....	18,100	190 (623)	76	19.0	11	7.9 (26)
<i>Tankers</i>						
28 T1.....	1,135	67 (221)	37	10.0	4	3.9 (13)
29 T1B-2.....	3,149	99 (325)	48	10.0	6	6.3 (19)
30 T2-E.....	10,536	160 (524)	68	14.5	13	9.1 (30)
31 ST2-F.....	10,462	160 (524)	68	16.0	10	9.1 (30)
32 T3.....	10,248	153 (502)	68	15.5	14	9.1 (30)
33 T5.....	16,442	191 (627)	84	18.0	18	10.0 (33)

^a Cruising range can be increased to 18,000 nautical miles if deep tanks are used for fuel oil. See footnote b in table 6-14.

^b FS type (freights service ship) is the 176-ft vessel built for the Army. It is an oceangoing vessel but, because of its small capacity, is used principally as an interisland carrier.

Table 6-13. Hold, Hatch and Boom Data

1	2	3	4	5	6
Vessel	Cargo holds (number)	Boom capacity (LTON)	Booms (number)	Capacity heavy lift rigs (LTON)	Hatches with hv lift booms (number)
<i>Dry Cargo</i>					
2 C1-A.....	5	-----	-----	30	-----
3 C1-B.....	5	5	15	30	2
4 C1-M.....	4	3-5 ^a	12	5	2-3
5 C2.....	5	5	17	30	3
6 C2-S.....	5	-----	-----	30-50	-----
7 C3.....	5	5-10	21	30	5
8 C3-S.....	5-7	-----	-----	25-50	-----
9 C4.....	7	5	24	50	4-5
10 C4-S.....	6-7	5-10	26	50-80	4-6
11 C5.....	5	-----	-----	5	-----
12 EC2.....	5	5	16	50 ^b	3-4
13 T-ARVH-1.....	5	22	12	50	2-4
14 FC ^c	2	5	5	5	2
15 N3.....	-----	-----	-----	50	-----
16 VC2.....	4-5	5	12	10-50 ^b	2-4
<i>Reefer cargo</i>					
17 C1-M.....	4	-----	-----	5	-----
18 C2-SU.....	5	-----	-----	30	-----
19 R1.....	3	-----	-----	10	-----
20 R1-D.....	4	-----	-----	20	-----
21 R2-A.....	4	-----	-----	35	-----
22 R2-B.....	5	-----	-----	30	-----
<i>Combined passenger-cargo and transports</i>					
23 C2A4.....	5	-----	-----	50	-----
24 C3P.....	7	-----	-----	50	-----
25 C4P1.....	7	-----	-----	5	-----
26 C449.....	5	-----	-----	20	-----
27 P2.....	-----	-----	-----	10	-----

See footnotes at end of table.

Table 6-13—Continued

1	2	3	4	5	6
Vessel	Cargo holds (number)	Boom capacity (LTON)	Booms (number)	Capacity heavy lift rigs (LTON)	Hatches with hv lift booms (number)
<i>Tankers</i>					
28 T1	6	-----	-----	3	-----
29 T1B-2	7	-----	-----	3	-----
30 T2-E	9	-----	-----	5	-----
31 ST2-F	9	-----	-----	5	-----
32 T3	8	-----	-----	5	-----
33 T5	9	-----	-----	30	-----

^a Two 3-ton booms (no 4 hatch) and ten 5-ton booms.

^b Some Liberty ships have a 30-ton boom at no 2 hatch and a 15-ton boom at no 4 hatch. Other Liberty ships have a 50-ton boom at no 2 hatch and a 30-ton boom at no 4 hatch. All Victory ships have a 30-ton boom at no 4 hatch.

^c FS type (freights service ship) is the 176-ft vessel built for the Army. It is an oceangoing vessel but, because of its small capacity, is used principally as an interisland carrier.

Table 6-14. Vessel Capabilities

1	2	3	4	5
Vessel	Total stowage ^{1,2} cap (MTON)	Grain cu cap (M cu ft) ¹	Reefer cargo (M cu ft)	Liquid cargo (M bbl)
<i>Dry cargo</i>				
2 C1-A	-----	446	-----	-----
3 C1-B	11.3	437	-----	4
4 C1-M	5.7	228	10	4
5 C2	11.8	546	-----	-----
6 C2-S	-----	449-546	0-30	0-6
7 C3	18.4	672	-----	11
8 C3-S	-----	477-643	0-70	0-24
9 C4	17.8	712	-----	-----
10 C4-S	18.4	480-7502	0-273	0-11
11 C5	-----	440	-----	-----
12 EC2	11.4	453	-----	-----
13 T-ARVH-1	.1	459	-----	5
14 FS ^a	.5	21	10	4
15 N3	-----	116	-----	-----
16 VC2	11.9	440-459	-----	5-11
<i>Reefer cargo</i>				
17 C1-M	-----	61	110	4
18 C2-SU	-----	-----	385	-----
19 R1	-----	48	115	4
20 R1-D	-----	-----	195	-----
21 R2-A	-----	-----	311	-----
22 R2-B	-----	-----	344	-----
<i>Combined passenger-cargo and transports</i>				
23 C2A4	-----	310	128	2
24 C3P	-----	457	59	-----
25 C4P1	-----	66	-----	-----
26 C449	-----	149	349	7
27 P2	-----	72	-----	-----
<i>Tankers</i>				
28 T1	-----	-----	-----	30
29 T1B-2	-----	4	-----	31
30 T2-E	.4	15	-----	141
31 ST2-F	-----	15	-----	141
32 T3	-----	25	-----	100-150
33 T5	-----	-----	-----	180-203

¹ On-deck space or lost space in atowage not included.

² Does not include cap deep tanks of which the Liberty-type ship has 3. Deep tanks no 1 and no 2, with approximately 16,000 cu ft of cap, may be used for dry or liquid cargoes if not in use for vessel voyage requirements. No 3 deep tank is rigged for either fuel oil or bulk cargo liquids. A 5,000-bbl (703 LTON) payload can be shipped in this tank if the contemplated voyage is to be short enough that no 3 tank will not be needed for fuel oil.

^a FS type (freights service ship) is the 176-ft vessel built for the Army. It is an oceangoing vessel but, because of its small capacity, is used principally as an interisland carrier.

Table 6-15. Detailed Capacities Below Deck

1	2	3	4	5	6	7	
1	Vessel	Hatch number	Hatch dimensions	Cargo capacities (MTON)			Deep tanks
				Upper 'tween	Lower 'tween	Hold	
2	C1-B-----	1	29 ft 3 in. by 20 ft-----	481	398	862	-----
		2	31 ft 6 in. by 20 ft-----	750	742	1,438	-----
		3	31 ft 6 in. by 20 ft-----	845	779	1,222	-----
				^a 102			
		4	31 ft 6 in. by 20 ft-----	780	1,229	-----	480
		5	31 ft 6 in. by 20 ft-----	574	608	-----	
Total-----				3,532	3,756	3,522	480
3	C1-M-AV1-----	1	20 ft 1 ½ in. by 19 ft 11 in.-----		601	616	-----
		2	40 ft 5 in. by 19 ft 11 in.-----		982	1,378	-----
		3	40 ft 5 in. by 19 ft 11 in.-----		901	1,179	-----
		4	9 ft by 8 ft-----		^b 169	113	-----
Total-----					2,653	3,286	-----
4	C2-S-AJ-----	1	26 ft 10 in. by 19 ft in.-----	602	519	947	-----
		2	32 ft 4 in. by 19 ft 10 in.-----	804	805	1,405	-----
		3	34 ft 10 in. by 19 ft 10 in.-----	908	968	1,514	-----
		4	29 ft 10 in. by 19 ft 10 in.-----	902	932	1,483	-----
		5	29 ft 10 in. by 19 ft 10 in.-----	722	-----	1,056	-----
Total-----				3,938	3,224	6,405	-----
5	EC2 (Liberty)-----	1	33 ft 7 in. by 19 ft 10 in.-----		983	902	416
		2	34 ft 10 in. by 19 ft 10 in.-----		1,065	2,300	-----
		3	19 ft 10 in. by 19 ft 10 in.-----		597	1,495	613
		4	34 ft 10 in. by 19 ft 10 in.-----		742	1,315	-----
		5	34 ft 10 in. by 19 ft 10 in.-----		771	1,290	-----
Total-----					4,158	7,302	1,029
6	VC2 (Victory)-----	1	24 ft 11 in. by 22 ft 3 in.-----	551	595	698	-----
		2	23 ft 11 in. by 23 ft 3 in.-----	675	545	698	-----
		3	35 ft 11 in. by 22 ft 3 in.-----	1,139	945	1,321	-----
		4	35 ft 11 in. by 22 ft 3 in.-----	1,230	-----	1,277	-----
		5	23 ft 11 in. by 22 ft 3 in.-----	1,091	-----	648	-----
Total-----				4,686	2,085	4,642	-----
7	C3-S-A2-----	1	35 ft 9 ½ in. by 19 ft 9 ½ in.-----	812	1,130	1,079	-----
		2	29 ft 9 ½ in. by 23 ft 9 ½ in.-----	830	1,381	1,396	-----
		3	37 ft 3 ½ in. by 23 ft 9 ½ in.-----	1,244	1,553	2,002	-----
		4	29 ft 9 ½ in. by 23 ft 9 ½ in.-----	1,164	1,255	1,419	-----
		5	39 ft 9 ½ in. by 23 ft 9 ½ in.-----	1,009	1,704	212	-----
Total-----				5,059	7,023	6,108	-----
8	C4-S-A4-----	1	17 ft 9 in. by 16 ft 8 in.-----	^c 496	^d 340	141	-----
		2	26 ft 10 in. by 17 ft 9 in.-----	^e 1,139	^d 1,258	772	-----
		3	26 ft 10 in. by 17 ft 9 in.-----	798	651	-----	^e 1,084
		4	26 ft 10 in. by 17 ft 9 in.-----	803	^d 1,533	994	-----
		5	26 ft 10 in. by 17 ft 9 in.-----	765	^d 1,515	1,017	-----
		6	26 ft 10 in. by 17 ft 9 in.-----	795	782	1,636	-----
		7	17 ft 9 in. by 17 ft 1 in.-----	^f 583	^f 454	-----	-----
Total-----				5,379	6,533	4,560	1,084
9	C4-S-B5-----	1	20 ft by 18 ft-----	608	293	-----	-----
		2	27 ft 6 in. by 20 ft-----	1,160	1,128	704	-----
		3	27 ft 6 in. by 20 ft-----	702	641	603	837
		4	30 ft by 20 ft-----	^g 1,626	764	1,047	-----
		5	30 ft by 20 ft-----	^g 1,623	772	1,055	-----
		6	30 ft by 20 ft-----	^g 1,540	794	998	-----
		7	20 ft 3 in. by 18 ft-----	95	482	358	-----
Total-----				7,354	4,874	4,765	837

See footnotes at end of table.

Table 6-15—Continued

1	1	2	3	4	5	6	7
	Vessel	Hatch number	Hatch dimensions	Cargo capacities (MTON)			
				Upper 'tween	Lower 'tween	Hold	Deep tanks
10	C4-S-1a (Mariner)---	1	19 ft 6 in. by 17 ft 9 in.-----	402	453	305	-----
		2	29 ft 10 in. by 23 ft 10 in.-----	731	865	637	-----
		3	39 ft 10 in. by 29 ft 10 in.-----	1,050	1,454	1,284	-----
		4	39 ft 10 in. by 29 ft 10 in.-----	1,006	1,500	1,528	-----
		5	39 ft 10 in. by 29 ft 10 in.-----	1,044	410	401	953
		6	39 ft 10 in. by 29 ft 10 in.-----	965	-----	1,646	298
		7	29 ft 10 in. by 24 ft 10 in.-----	1,627	-----	856	-----
Total-----				6,825	4,682	6,657	1,251
11	FS freighter-----	1	20 ft by 16 ft-----	-----	-----	251	-----
		2	28 ft by 16 ft-----	-----	-----	285	-----
Total-----				-----	-----	536	-----

^a Special cargo locker on upper 'tween level between hatches No. 3 and 4.

^b Includes 36 MTON in trunked hatch.

^c Includes upper deck and second deck.

^d Includes third deck and first platform.

^e Liquid cargo space.

^f Includes refrigerated cargo space.

^g Includes main 'tween deck.

Table 6-16. Deadweight Tonnage

1	2	3	4
Vessel	Maximum ship-operating supplies* (LTON)	Cargo capacity tonnage when operating supplies (LTON) are maximum*	Total (LTON)
2 Liberty	2,800	8,000	10,800
3 Victory	3,100	7,500	10,600
4 C1-B	1,850	7,250	9,100
5 C1-M-AV1	1,047	6,393	7,440
6 Mariner	4,065	9,353	13,418

*Operating supplies include fuel, water, dunnage, and ship stores. Additional payload capacity may be substituted to a limited extent depending on length of voyage and type of cargo, which will warrant a reduction in such ship-operating supplies.

Table 6-17. Vehicle Loading Capacities of Vessels

1	2	3	4	5	6	7	8	9	10	11
Vessel	Trucks, utility ¼-ton, 4x4 ^a		Trailers, cargo, 1½-ton 2-wheel ^a		Trucks, cargo, ¾-ton 2-wheel ^a		Trucks, cargo 2½-ton, 6x6, LWB		Trucks, cargo, 5-ton, 6x6, LWB	
	On wheels	Crated ^b	On wheels	Crated ^b	On wheels	Crated ^b	On wheels	Crated ^b	On wheels	Crated ^{b,c}
2 Liberty	498	2,078	404	4,493	312	744	^d 185	357	102	-----
3 Victory	512	1,983	512	4,287	331	710	193	340	114	-----
4 C1-B	511	1,912	491	4,133	337	684	182	328	145	-----
5 C1-M-AV1	314	645	261	456	167	280	111	114	61	-----
6 Mariner	1,181	1,740	891	1,732	665	966	364	328	229	-----

^a Double the number of ¼-ton trucks on wheels can be stowed if they are stacked. It also is estimated that at least 35-percent more 1½-ton trailers can be loaded if stowed in tandem with drawbar nested inside body of preceding trailer, provided tailgates are drop type. Regarding the other three types of vehicles, more can be stowed in the Liberty ship by double-decking; see footnote b, table 6-18.

^b All crated vehicles are boxed by single units except the 1½-ton trailers, which are boxed by twin units.

^c The 5-ton truck, M54, is not shipped crated.

^d 153 ¼-ton trucks may be loaded in the bodies of 153 of these trucks. The other 32 trucks will not take jeeps because of the limiting height of the compartments in which stowed. As an alternative, a total of 215 trucks can be stowed by double-decking in No. 2 and 3 holds.

Table 6-18. Detailed Vehicle Loading Capacities (Stowed on Wheels) of Vessels

1	2	3	4	5	6	7
Hatch number	Location	Trucks, utility, $\frac{1}{2}$ -ton 4x4	Trailers, cargo, $1\frac{1}{2}$ -ton 2-wheel	Trucks, cargo, $\frac{3}{4}$ -ton, 4x4	Trucks, cargo, $2\frac{1}{4}$ -ton, LWB	Trucks, cargo, 5-ton, 6x6 LWB
<i>Liberty ship</i>						
2	1 'Tween deck	28	27	23	12	8
3	Lower hold	28	24	18	10	5
4	On deck	22	22	14	9	6
5	2 'Tween deck	54	44	^a 30	21	12
6	Lower hold	48	42	^a 30	^a 18	12
7	On deck	41	36	20	13	8
8	3 'Tween deck	36	28	25	14	6
9	Lower hold	32	28	22	^a 12	6
10	On deck	22	14	10	6	4
11	4 'Tween deck	41	37	27	16	8
12	Lower hold	20	15	18	10	2
13	On deck	31	20	16	11	8
14	5 'Tween deck	44	34	25	16	9
15	Lower hold	20	11	20	6	2
16	On deck	31	22	14	11	6
<i>Victory ship</i>						
17	1 Upper 'tween deck	15	16	9	5	0
18	Lower 'tween deck	16	18	9	6	3
19	Hold	15	13	8	4	3
20	On deck	14	12	6	5	4
21	2 Upper 'tween deck	29	26	17	10	4
22	Lower 'tween deck	25	24	17	10	5
23	Hold	21	21	14	8	3
24	On deck	18	16	12	7	4
25	3 Upper 'tween deck	48	48	29	17	12
26	Lower 'tween deck	46	46	30	18	12
27	Hold	44	46	30	18	8
28	On deck	25	29	18	13	8
29	4 'Tween deck	49	48	34	16	14
30	Hold	49	49	31	18	13
31	On deck	23	25	18	13	8
32	5 'Tween deck	30	31	20	12	6
33	Hold	20	19	12	7	3
34	On deck	25	25	17	6	4
<i>C1-B^b</i>						
35	1 Upper 'tween deck	21	18	12	6	4
36	Lower 'tween deck	21	18	12	6	5
37	Lower hold	14	13	9	4	4
38	On deck	14	14	12	5	7
39	2 Upper 'tween deck	46	37	25	13	12
40	Lower 'tween deck	42	37	25	15	12
41	Lower hold	34	36	21	13	11
42	On deck	25	21	18	12	7
<i>C1-B^b</i>						
43	3 Upper 'tween deck	44	42	30	17	12
44	Lower 'tween deck	41	42	28	13	12
45	Lower hold	41	42	28	13	9
46	On deck	23	21	14	10	5
47	4 Upper 'tween deck	39	41	26	14	12
48	Lower 'tween deck	36	37	24	12	10
49	On deck	21	21	14	10	7
50	5 'Tween deck	23	23	15	7	5
51	Hold	10	10	12	6	6
52	On deck	16	18	12	7	5

See footnotes at end of table.

Table 6-18—Continued

1	2	3	4	5	6	7
Hatch number	Location	Trucks, utility, ¼-ton 4x4	Trailers, cargo, 1½-ton 2-wheel	Trucks, cargo, ¾-ton, 4x4	Trucks, cargo, 2½-ton, LWB	Trucks, cargo, 5-ton, 6x6 LWB
<i>C1-M-AV1°</i>						
53	1 'Tween deck	30	23	16	10	3
54	Hold	16	13	7	4	2
55	On deck	20	14	13	7	4
56	2 'Tween deck	51	46	28	19	10
57	Hold	51	45	28	19	10
58	On deck	30	24	18	10	8
59	3 'Tween deck	44	37	27	17	9
60	Hold	44	37	26	15	9
61	On deck	28	22	14	10	6
<i>Mariner</i>						
62	1 Upper 'tween deck	20	16	12	6	4
63	Lower 'tween deck	14	10	9	4	0
64	Hold	9	5	6	3	0
65	On deck	20	20	11	7	4
66	2 Upper 'tween deck	37	23	22	11	7
67	Lower 'tween deck	26	21	15	9	7
68	Hold	15	11	9	5	2
69	On deck	33	23	20	10	7
70	3 Upper 'tween deck	61	48	38	25	13
71	Lower 'tween deck	52	44	32	21	13
72	Hold	36	32	22	14	9
73	On deck	52	42	30	20	10
74	4 Upper 'tween deck	69	46	38	20	14
75	Lower 'tween deck	69	46	38	20	14
76	Hold	56	44	30	16	12
77	On deck	52	36	26	18	10
78	5 Upper 'tween deck	72	56	42	18	14
79	Lower 'tween deck	74	58	44	^d 18	^d 14
80	Hold	72	56	42	^d 16	^d 12
81	Deep tank	36	28	14	6	2
82	On deck	54	36	28	20	12
83	6 'Tween deck	65	47	36	18	14
84	Hold	34	30	20	12	9
85	Deep tank	10	4	0	0	0
86	On deck	54	40	30	20	12
87	7 'Tween deck	42	33	23	11	7
88	Hold	10	9	6	4	0
89	On deck	37	27	22	12	7

^a Based on no centerline bulkhead, which may not be standard equipment.

^b Number of vehicles (except 5-ton, 6x6) in lower holds of No. 2 and 3 hatches can be doubled by flooring over one layer of vehicles and loading a second layer directly on top. The depth of only these two holds will permit such double-decking.

^c No. 4 hatch is not large enough for vehicle loading.

^d On nonrefrigerated type only. Approximately three 5-tons or four 2½-tons can be loaded on these decks on refrigerated-type vessels.

Table 6-19. Approximate Sailing Distance in Nautical Miles

1	2	3	4	5	6	7	8
Ports	Ports of embarkation						
	Boston	New York	Charleston	New Orleans	Los Angeles	San Francisco	Seattle
<i>United States</i>							
2 Boston		200	900	2,000	^a 5,100	^a 5,400	^a 6,200
3 New York	200		600	1,700	^a 4,900	^a 5,300	^a 6,000
4 Charleston	900	600		1,220	^a 4,500	^a 4,900	^a 5,600
5 New Orleans	2,000	1,700	1,200		^a 4,300	^a 4,700	^a 5,500
6 Los Angeles	^a 5,100	^a 4,900	^a 4,500	^a 4,300		400	1,100
7 San Francisco	^a 5,400	^a 5,300	^a 4,900	^a 4,700	400		800
8 Seattle	^a 6,200	^a 6,000	^a 5,600	^a 5,500	1,000	800	
<i>North Atlantic</i>							
9 Newfoundland, St. John's	900	1,100	1,700	2,600	^a 5,700	^a 6,000	^a 6,800
10 Greenland, Ivigtut	1,700	1,900	2,400	3,400	^a 6,500	^a 6,800	^a 7,600
11 Iceland Reyjavik	2,300	2,500	3,000	4,000	^a 7,100	^a 7,400	^a 8,200

See footnotes at end of table.

Table 6-19—Continued

	1	2	3	4	5	6	7	8
1	Ports	Ports of embarkation						
		Boston	New York	Charleston	New Orleans	Los Angeles	San Francisco	Seattle
	<i>Europe</i>							
	United Kingdom:							
12	Liverpool.....	3,000	3,200	3,700	4,700	^a 7,600	^a 7,900	^a 8,700
13	Southampton.....	3,000	3,200	3,600	4,600	^a 7,500	^a 7,800	^a 8,600
14	Northern Ireland, Belfast.....	2,900	3,000	3,400	4,400	^a 7,200	^a 7,500	^a 8,300
15	Norway, Oslo.....	3,900	4,100	4,400	5,300	^a 8,200	^a 8,600	^a 9,400
	Russia:							
16	Archangel.....	4,000	4,200	4,800	5,800	^a 8,800	^a 9,200	^a 10,000
17	Murmansk.....	3,700	3,800	4,400	5,400	^a 8,500	^a 8,900	^a 9,700
	France:							
18	Le Harve.....	3,000	3,200	3,600	4,600	^a 7,500	^a 7,800	^a 8,600
19	Brest.....	2,900	3,100	3,500	4,500	^a 7,400	^a 7,700	^a 8,500
20	Bordeaux.....	3,000	3,200	3,700	4,700	^a 7,600	^a 7,900	^a 8,700
21	Belgium, Antwerp.....	3,200	3,400	3,800	4,800	^a 7,700	^a 8,000	^a 8,800
	<i>Mediterranean</i>							
22	France, Marseille.....	^b 3,700	^b 3,900	^b 4,300	^b 5,300	^a 8,000	^a 8,200	^a 9,000
23	Italy, Naples.....	^b 4,000	^b 4,200	^b 4,600	^b 5,600	^a 8,300	^a 8,500	^a 9,300
24	Algeria, Algiers.....	^b 3,400	^b 3,600	^b 4,000	^b 5,000	^a 7,700	^a 8,000	^a 8,800
25	Strait of Gibraltar.....	3,000	3,200	3,600	4,600	^a 7,300	^a 7,500	^a 8,300
	<i>Caribbean and South Atlantic</i>							
26	Bermuda, Hamilton.....	700	700	800	1,700	^a 4,600	^a 4,900	^a 5,800
27	Puerto Rico, San Juan.....	1,500	1,400	1,100	1,500	^a 8,900	^a 4,300	^a 5,100
28	Trinidad, Port of Spain.....	2,000	1,900	1,700	2,100	^a 4,100	^a 4,400	^a 5,300
29	Brazil, Rio de Janeiro.....	4,700	4,800	4,700	5,200	^a 7,200	^a 7,600	^a 8,400
30	Argentina, Buenos Aires.....	5,800	5,900	5,800	6,300	^a 8,300	^a 8,700	^a 9,600
31	Panama Canal, Panama.....	2,200	2,000	1,600	1,400	2,900	^a 3,200	^a 4,000
	<i>Middle East</i>							
32	Egypt, Port Said.....	^b 4,900	^b 5,100	^b 5,500	^b 6,500	^a 9,200	^a 9,500	^a 10,300
33	Arabia, Aden.....	^b 6,300	^a 6,500	^b 6,900	^b 7,900	^a 10,600	^a 10,900	^a 11,700
34	Turkey, Istanbul.....	^b 4,800	^b 5,000	^b 5,400	^b 6,400	^a 9,100	^a 9,400	^a 10,200
35	Iran, Khorramshahr (Persian Gulf).....	^b 8,300	^b 8,500	^b 8,900	^b 9,800	^a 12,600	^a 12,900	^a 13,700
	<i>North Pacific</i>							
36	Alaska, Dutch Harbor.....	^a 7,400	^a 7,300	^a 6,900	^a 6,700	^a 2,400	2,100	1,700
37	East Russia, Vladivostok.....	^a 9,500	^a 9,300	^a 8,900	^a 8,700	5,000	4,600	4,400
	<i>Middle Pacific</i>							
38	Hawaiian Islands, Honolulu.....	^a 6,900	^a 6,700	^a 6,300	^a 6,100	2,200	2,100	2,400
39	Marshall Islands, Kwajalein.....	^a 9,200	^a 9,000	^a 8,600	^a 8,400	4,200	4,400	4,500
40	Mariana Islands, Guam.....	^a 10,200	^a 10,000	^a 9,600	^a 9,400	5,600	5,100	4,900
41	Japan, Yokohama.....	^a 9,900	^a 9,600	^a 9,500	^a 9,100	4,800	4,500	4,200
	<i>Southwest Pacific</i>							
42	New Guinea, Finschhafen.....	^a 10,200	^a 10,000	^a 9,600	^a 9,400	6,100	5,900	6,000
43	Philippines Islands, Manila.....	^a 11,600	^a 11,300	^a 11,000	^a 10,800	6,600	6,300	6,100
	Australia:							
44	Brisbane.....	^a 9,900	^a 9,600	^a 9,300	^a 9,100	6,300	6,200	6,500
45	Melbourne.....	^a 10,100	^a 9,900	^a 9,500	^a 9,400	7,000	7,000	7,300
46	Malaya, Singapore.....	^b 9,900	^a 10,100	^b 10,500	^b 11,500	7,900	7,500	7,100
	<i>China-Burma-India</i>							
	China:							
47	Shanghai.....	^a 10,800	^a 10,600	^a 10,200	^a 10,000	5,700	5,400	5,100
48	Hong Kong.....	^a 11,400	^a 11,200	^a 10,800	^a 10,600	6,400	6,000	5,700
	India:							
49	Bombay.....	^b 8,000	^b 8,200	^b 8,600	^b 9,500	^{a, b} 12,200	^{a, b} 12,600	^{a, b} 13,400
						10,300	9,600	9,500
50	Calcutta.....	^b 9,600	^b 9,800	^b 10,200	^b 11,200	^{a, b} 13,900	^{a, b} 14,200	^{a, b} 15,000
						9,500	9,100	8,700
51	Burma, Rangoon.....	^b 9,600	^b 9,800	^b 10,200	^b 11,200	^{a, b} 13,900	^{a, b} 14,200	^{a, b} 15,000
						9,000	8,600	8,200
	<i>Southeast Asia</i>							
52	Thailand, Bangkok.....	^a 10,600	^a 10,400	^a 10,000	^a 9,800	7,900	7,500	7,100
	South Vietnam:							
53	Saigon.....	^a 10,400	^a 10,300	^a 9,800	^a 9,600	7,300	6,900	6,500
54	Cam Ranh Bay.....	^a 10,300	^a 10,100	^a 9,700	^a 9,500	7,100	6,700	6,300
55	Da Nang.....	^a 10,400	^a 10,200	^a 9,800	^a 9,600	6,900	6,500	6,100

^a Via Panama Canal.^b Via Strait of Gibraltar.

6-15. Approximate Sailing Distances in Nautical Miles

Table 6-19 provides nautical-mile sailing distances from various U.S. ports to other U.S. ports and to ports throughout the world.

6-16. Shipping Turnaround Times

a. General. Turnaround time for similar-type ships seldom is the same between two ports, or other equidistant runs, unless sailings are carefully controlled. Assuming controlled operating conditions, a basis for turnaround times can be established for typical ships (troop or cargo) for general planning purposes.

b. Turnaround Time Components. These components are —

- (1) Loading time at home port.
- (2) Steaming time to and from destination.
- (3) Unloading and loading time at destination.
- (4) Unloading time at home port.
- (5) Normal voyage repair and reoutfitting time.

c. Planning Factors.

(1) Sailing distances per day.*

(a) Cargo ships.

1. Slow — 240 nautical miles.
2. Fast — 360 nautical miles.

(b) Passenger ships.

1. Slow — 360 nautical miles.
2. Fast — 432 nautical miles.

(2) Time in ports per round trip for unloading, loading, voyage repairs, and reoutfitting.

(a) Cargo ships — 35 days.

(b) Troop ships — 20 days.

(c) Tankers — 10 days.

(3) Convoys and effect on turnaround time.

A major portion of shipping may be conducted in convoy formation, the speed of which is dictated by the slowest vessel in each convoy. The planner must consider this factor in computing turnaround time for convoy or escorted shipping.

(4) *Convoy sailing times.* Table 6-20 provides convoy sailing times (in days) from various U.S. ports to other U.S. ports and to ports throughout the world.

*For convoy sailing speed of advance, deduct 10 percent for delays in forming convoys, zigzagging en route, etc. The 10 percent loss factor is not applicable to ships in the "fast" category since such ships normally will proceed individually.

Table 6-20. Convoy Sailing Times (Days)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Ports	Ports of embarkation*													
		Boston		New York		Charleston		New Orleans		Los Angeles		San Francisco		Seattle	
		Type of shipping													
		Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo	Troop	Cargo
United States															
2	Boston.....									48	72	50	74	54	82
3	New York.....									46	70	49	74	53	80
4	Charleston.....									45	67	47	71	51	77
5	New Orleans.....									44	67	46	69	51	77
6	Los Angeles.....	48	72	46	70	45	67	44	67						
7	San Francisco.....	50	74	49	74	47	71	46	69						
8	Seattle.....	54	82	53	80	51	77	51	77						
North Atlantic															
9	Newfoundland, St. John's.....			27	40	30	45	36	53	55	82	57	85	61	92
10	Greenland, Ivigtut.....	30	45	31	47	35	52	41	61	60	89	62	92	66	100
11	Iceland, Reykjavik.....	34	50	35	52	38	57	44	67	63	95	65	97	70	106
Europe															
United Kingdom:															
12	Liverpool.....	38	57	39	59	43	64	49	73	66	100	68	102	73	110
13	Southampton.....	38	57	39	59	42	63	48	72	66	99	68	102	72	109
14	Northern Ireland, Belfast...	38	56	38	57	41	61	47	70	64	96	66	99	71	106
15	Norway, Oslo.....	44	66	45	68	47	70	52	78	70	105	72	109	77	116
Russia:															
16	Archangel.....	44	67	46	69	49	74	55	83	73	111	76	114	81	122
17	Murmansk.....	43	64	43	65	47	70	53	80	72	103	74	112	79	119

See footnote at end of table.

Section III. RAIL

6-17. General

a. Chapter 7 contains railway construction data.

b. Estimates of railway capacity, operating personnel, equipment, and supply requirements for a specific railway line should reflect consideration of the basic characteristics of the line, the nature of the country in which the operation is planned, and the purpose for which the planning is being done. The following items are essential to intelligent appraisal. If detailed information on these items is not available, their effects on the operation must be assumed, based on overall information of railroad operations in the country involved.

- (1) Length of the line.
- (2) Condition of roadbed and track.
- (3) Gage of track.¹
- (4) Single, double, or multiple track.
- (5) Weight and cross section of rail. (Where mixed rail occurs, a complete inventory of rail and compromise rail joints is desirable.)
- (6) Type of ballast and depth.
- (7) Type of ties (if wood, treated or untreated).
- (8) Tie spacing.
- (9) Axle load limitations (track and bridge).
- (10) Profile of line showing location and length of ruling grade. (Any helper grade or any momentum grade that is not the ruling grade should show location and description.)
- (11) Alinement of line showing location, length of minimum radius curves, and super-elevation.
- (12) Location and description of bridges and tunnels.
- (13) Location, length, and description of passing tracks.
- (14) Location, type, and quantity of fuel supply.
- (15) Location, quantity, and quality of water supply.
- (16) Location and capacity of yards.

¹Track gages vary widely, starting at 0.60 meters (23 $\frac{3}{8}$ inches) and going to 1.676 meters (66 inches). The most widely used gages are—

Broad	Narrow	Standard
1.676 meters (66 inches) -----	1.067 meters (42 inches)	-----
1.60 meters (63 inches) -----	1.00 meters (39 $\frac{3}{8}$ inches)	1.435 meters (56 $\frac{1}{2}$ inches)
1.524 meters (60 inches) -----	0.914 meters (36 inches)	-----

- (17) Location and capacity of —
 - (a) Car repair tracks and enginehouses.
 - (b) Heavy repair shops.
- (18) Type and availability of motive power.
 - (a) Weight in working order.
 - (b) Expected working tractive effort.
 - (c) Age.
- (19) Type and availability of rolling stock.
 - (a) Capacity and dimension.
 - (b) Age.
- (20) Allowable drawbar pull.
- (21) Diagrams showing minimum structure, maximum unrestricted loading, and equipment gages.
- (22) Signal system.
- (23) Dispatching facilities.
- (24) Route junctions.
- (25) Availability of new equipment and repair parts.
- (26) Indigenous labor resources.
- (27) Determination of the attitude and loyalty of local personnel. (Can guerrilla operations be expected?)

c. A military railway operating division will vary from approximately 150 to 250 kilometers, depending on existing conditions. For general planning, however, an average of 150 kilometers per railway division may be assumed.

6-18. Evaluation and Planning

Paragraphs 6-19 through 6-27 are designed primarily for wartime estimates of railway operations in a theater of operations. Analytical refinements and elaborate train density studies are difficult to justify and have been avoided because of the lack of basic information and the relative uncertainty inherent in military operations. The planner should also remember that in the early stages of a war indigenous equipment and labor may be used to a large extent, which again may vary the expected tonnage capacity. A more detailed estimate may be made using those methods and factors contained in FM 55-20.

6-19. Train Density

Train density is the number of trains per day that can be operated in each direction over a railway line. Work trains are not included in train density. Train densities vary, depending on the condition of track; location, length, and type of passing siding; adequacy of terminal facilities; and availability of motive power and rolling stock. Densities recommended below are averages based

on experience under theater of operation conditions. After air superiority has been attained and the intensity of combat has been reduced, depending on judgment of operating conditions, densities achieved may be expected to exceed by 20 percent those presented below. (Planning capacities are discussed in para 6-3.)

Single-track lines²..... 10 trains per day in each direction.
 Double-track lines..... 30 trains per day in each direction.
 Multiple-track lines.... The extra tracks will be used to rehabilitate and maintain two tracks in operation under most theater of operation conditions.

6-20. Net Trainload

The net trainload, or payload, carried by trains on different divisions of the same line may vary greatly, depending on the conditions of operation. Experience indicates that, under normal theater of operation conditions over standard gage railways, a single-engine net trainload of 400 STON may be used as an *average* for planning purposes; on narrow gage railways, a single-engine net trainload of 300 STON may be used.

6-21. Net Division Tonnage

a. Net division tonnage is the net tonnage (STON) or payload that can be moved over a railway division each day.

b. Troop, hospital, or other special trains will replace an equal number of tonnage trains; and, when operation of such trains is anticipated, the factor for train density must be so adjusted with the resulting decrease in net division tonnage.

6-22. Equipment Estimation

Planning data included herein are based on use of standard U.S. Transportation Corps equipment. Allowances for use of indigenous or captured equipment should be based on judgment after evaluation of the many factors involved, such as availability of equipment, extent of expected destruction, condition of equipment, types and local availability of fuel, availability of repair parts, types of coupling devices, etc. Planning data are available in FM 55-15, TM 55-206, logistic surveys, special transportation studies based on intelligence reports, reports of governments or railroads in peacetime, and from articles appearing in such publications as *Railway Gazette* (British) and *Railway Age* (U.S.).

a. *Road Engines*. The following data are recommended for general planning. (Computation of requirements should be made for each division separately.)

² Allows time for locomotive servicing, running repairs, and time lost between enginehouses and yards.

(1) Average rate of travel from division terminal to division terminal — 13 kilometers per hour.

(2) Time in each division terminal for steam locomotives — 8 hours.³

(3) Time in each division terminal for diesel-electric locomotives — 3 hours.³

(4) Reserve engines, to allow for unforeseen circumstances, such as operational peaks, heavy repairs, or destruction — 20 percent.

Formula:

$$TD \times \frac{RT + TT}{24} \times 2 RF = \frac{TD}{10} \times (RF + TT) + \text{number re-}$$

quired for division, when

TD = train density one way

RT = average running time in hours

TT = terminal time at one end of the division

24 = number of hours in a day

RF = operational reserve factor = 1.2

b. Switch Engines.

(1) Switch-engine requirements at water and inland terminals and division terminals are dependent on the physical track layout and the number of cars to be handled at such points. The following may be used as a general guide only:

(a) For water and inland terminals, one per 67 cars dispatched or received per day.

(b) For division terminals, one per 100 cars passing per day.

(2) Requirements as computed above should be increased by 20 percent to allow for unforeseen circumstances, repairs, etc.

c. Rolling Stock.

(1) Freight.

(a) Requirements are computed separately for operations between major supply installations or areas on each line of communications as follows:

$$\frac{\text{Daily tonnage}}{\text{average tons per car}} \times \text{turnaround time} = \text{number of cars}$$

Turnaround time is the total estimated number of days required for a car from the time it is placed for loading at its point of origin, moved to its destination, unloaded, and returned to its point of origin. Such time may be computed as follows: allow 2 days at origin, 1 day at destination, and 2 days' transit time for each division (or major portion thereof) that the cars must traverse. This method, rather than an actual hour basis, is used to incorporate delays due to terminal and way-station switching and intransit rehandling of trains.

³ Allows time for locomotive servicing, running repairs, and time lost between enginehouses and yards.

(b) Computations should be increased by 10 percent to meet operational peaks, commitments for certain classes of cars, and bad order cars.

(c) An average planning factor for net load per car may be assumed as follows:

<i>Standard gage to broad gage</i>	
U.S. equipment.....	20 tons
Foreign equipment.....	10 tons
<i>Narrow gage</i>	
U.S. equipment.....	15 tons
Foreign equipment.....	7½ tons

(d) Tank car requirements are computed separately, based on the bulk POL requirement and the computed turnaround time.

(2) *Passenger.*

(a) Passenger car requirements vary, depending on troop movement policies, evacuation policies, and rest and recuperation policies.

(b) Theater passenger car requirements are normally fulfilled by acquisition of local equipment, with the exception of hospital cars or trains.

6-23. Characteristics of U.S. Rolling Stock

Table 6-21 contains the characteristics of U.S. rolling stock.

6-24. Outsize Equipment

Outsize equipment is that which, because of extreme dimensions (height width, length) or extreme weight, or combinations of the foregoing requires special handling under restricted speeds and/or on special cars. The planner should recognize that more and more of this type of equipment is being designed and he should attempt to build a train of these outsize loads for a single movement rather than to place a few in each train moving on the line of communications. Such movements require special meeting points on adjacent lines of a double-track and retard returning traffic and trains following in the same direction.

6-25. Personnel Requirements

The basic unit of railway organization in a theater of operations is the transportation railway battalion. This battalion operates and maintains a division of railway that is similar to U.S. commercial railroad organization. Military organizations of administrative and operating personnel are designed to fulfill the operating personnel needs of the basic units (railway divisions) and the administrative personnel needs of the several divisions comprising a railway system. Personnel requirements are therefore estimated by division.

6-26. Supervisory, Operating, and Maintenance Organizations

a. Supervisory. The following organizations are supervisory:

(1) Headquarters and headquarters company, transportation railway brigade (TOE 55-201). It commands and supervises transportation railway groups in a large landmass theater.

(2) Headquarters and headquarters company, transportation railway group (TOE 55-202). Normal requirements are one per two to six transportation railway battalions and one or two transportation railway shop battalions.

b. Operating. The transportation railway battalion (TOE 52-225) is an operating organization.

(1) Requirements are estimated on the basis of the number of traincrews required. The 40 traincrews provided in the operating company of the battalion are the controlling factor. When augmentation is necessary, additional crews are provided from TOE 55-500. This augmentation does not upset the equilibrium of the battalion for carrying out its assigned function, provided the normal length of line to be operated is not exceeded or motive power added does not exceed the capabilities of the equipment maintenance company. Normally one transportation railway battalion is assigned to a railway division (usually 145-252 kilometers of main track).

(2) In estimating traincrew requirements, the following basis may be used:

(a) For road operations: one crew per train per day (moving in either direction) per division.

(b) For switching: Two crews per switching engine in operation. (For general planning, reserve switch engines are not considered.)

(c) For road operations and switching: assume 80-percent availability of assigned crews to allow for sickness and other absences.

c. Maintenance. The following organizations are maintenance:

(1) Diesel — electric locomotive repair company (TOE 55-247). This unit performs general support maintenance on diesel-electric locomotives and locomotive cranes. Capabilities include general support (heavy) maintenance on 25 diesel-electric locomotives and/or locomotive cranes per month.

(2) Transportation railway car repair company general support (TOE 55-248). This unit performs general support (heavy) maintenance on railway cars. General support capabilities include maintenance of 600 railway cars per month. This unit also has a supply mission. It receives,

Table 6-21. Characteristics of U.S. Rolling Stock

	1	2	3	4	5	6	7	8
1	Type of car	Gage	Capacity		Tare weight (empty tons)	Inside dimensions		
			Cargo space	Tons		Length	Width	Height
Foreign Service								
2	Box (30-ton).....	Narrow.....	1,588 cu ft.....	30	13.6	34 ft 5½ in.	7 ft ¾ in.	6 ft 4 in.
3	Box (40-ton).....	Std to broad.....	2,520 cu ft.....	40	18.5	40 ft 6 in.	8 ft 6 in.	6 ft 5⅞ in.
4	Flat (30-ton).....	Narrow.....	247 sq ft.....	30	10.9	34 ft 5⅞ in.	7 ft 2 in.	
5	Flat (40-ton).....	Std to broad.....	351 sq ft.....	40	14.5	40 ft 9 in.	8 ft 7¼ in.	
6	Flat (80-ton).....	Std to broad.....	447 sq ft.....	80	33.3	46 ft 4 in.	9 ft 8 in.	
7	Flat, depressed center (70-ton).....	Std to broad.....	193 sq ft.....	70	41.5	50 ft 7 in.	9 ft 8 in.	
8	Gondola, high-side (30-ton).....	Narrow.....	946 cu ft.....	30	13.0	34 ft 5 in.	6 ft 10½ in.	4 ft.
9	Gondola, high-side (40-ton).....	Std to broad.....	1,680 cu ft.....	40	18.0	40 ft.	8 ft 8¾ in.	4 ft.
10	Gondola, low-side (30-ton).....	Narrow.....	356 cu ft.....	30	12.1	34 ft 6 in.	6 ft 10½ in.	1 ft 6 in.
11	Gondola, low-side (40-ton).....	Std to broad.....	500 cu ft.....	40	16.0	40 ft 4½ in.	8 ft 3¼ in.	1 ft 6 in.
12	Tank, POL (6,000-gal).....	Narrow.....	6,000 gal.....	20	16.0	.....	.....	.....
13	Tank, POL (10,000-gal).....	Std to broad.....	10,000 gal.....	35	19.0	.....	.....	.....
Domestic service								
14	Box (50-ton).....	Std.....	3,975 cu ft.....	50	23.0	40 ft 6 in.	9 ft 2 in.	11 ft.
15	Flat (50-ton).....	Std.....	454 sq ft.....	50	25.5	43 ft 3 in.	10 ft 6 in.	
16	Flat (70-ton).....	Std.....	513 sq ft.....	70	27.0	49 ft 11 in.	10 ft 3 in.	
17	Flat (100-ton).....	Std.....	562 sq ft.....	100	35.0	54 ft.....	10 ft 6¼ in.	
18	Gondola, high-side (50-ton).....	Std.....	1,770 cu ft.....	50	25.0	41 ft 6 in.	9 ft 6 in.	4 ft 6 in.
19	Gondola, low-side (50-ton).....	Std.....	1,184 cu ft.....	50	23.0	41 ft 6 in.	9 ft 6 in.	3 ft.
20	Tank, POL (10,000).....	Std.....	10,000 gal.....	35	23.0	.....	.....	.....

Note. Average payload for each type of car, except tank cars, is 50 percent.

stores, and issues 8,000 line items of railway supplies and repair parts per month in support of four to six transportation railway battalions.

6-27. Supply

a. Fuel and Lubricants. Fuel and lubricants are discussed in paragraphs 5-6 and 5-7.

b. Repair Parts. Estimated repair parts requirements for motive power and rolling stock are 1.5 STON per month for each train per day (moving in either direction) over each division.

6-28. Space Requirements for Troop Loading on U.S. Equipment (CONUS Only)

a. Capacities of standard U.S. passenger cars are given in table 6-22.

Table 6-22. Capacities of Standard U.S. Passenger Cars

1	2	3	4
Dimensions and capacity	Day coach	Tourist sleeper	Standard sleeper
2 Length in feet.....	65-75	65-75	65-80
3 Number of sections.....	None	13-16	12-16
Maximum seating:			
4 2 men to each double seat.....	60-70	52-64	53-64
5 3 men to each 2 double seats.....	45-52	39-48	40-48
Sleeping capacity:			
6 2 men per berth (maximum).....	None	52-64	53-64
7 3 men per section.....	None	39-48	36-48
8 1 man per berth.....	None	26-32	27-32

b. For planning and staff training, the following assumptions may be used:

(1) Coaches, average — 54 troops with individual equipment.

(2) Sleeping cars, average — 27 troops in a standard pullman.

c. A typical passenger train for long-distance moves consists of seven day coaches, 14 sleeping cars, two kitchen cars, two diner cars, and one or two baggage cars. Mixed trains, which carry both personnel and freight (vehicles, artillery, and equipment), are authorized only for reasons of military necessity. They are, at times, desirable from a tactical and organizational standpoint. Such moves are not economical when passenger equipment is in short supply because mixed trains move at freight speed and equipment is not fully used.

6-29. Kitchen, Diner, and Baggage Cars

In assembling a passenger train, kitchen, diner, and baggage cars are assigned on the basis of one per 250 men or fraction thereof.

6-30. Loading of Equipment and Supplies

a. The amount of headquarters, kitchen, and maintenance equipment varies somewhat in all units. For planning, allow 20 STON per company or equivalent unit.

b. For company or larger unit movements, container express (CONEX) containers should be used wherever practicable for consolidation and security of organizational equipment and baggage.

c. The rated weight capacity of a car does not mean that the car can carry the rated tonnage of all items. For many types of cargo, the cubic capacity of the car is reached before the rated tonnage. Such low-density items include class I supplies, clothing and blankets, tentage, and motor vehicle parts.

d. In loading high-density items, the rated tonnage of the car will be reached before the cubic capacity is met. Examples of high-density items are ammunition, barbed wire, corrugated iron, cement, rifles in chests, telephone wire, and engineer tools.

6-31. Flatcar Requirements

a. Flatcar requirements (table 6-23) are based on maximum utilization of each car. The following flatcars should be used for planning purposes:

40.0-foot.....	50-ton
46.0-foot.....	50-ton
50.5-foot.....	50-ton
56.0-foot.....	200-ton

Computation should not be restricted to cars of one length. From 1 to 2 feet per car normally is an adequate allowance for vehicle tiedowns and bracing.

b. Maintenance of unit integrity requires 10-percent additional flatcars over those required for separate loading. Freight trains moving heavy equipment, such as tanks, artillery, vehicles, and engineer equipment, seldom exceed 65 cars or 1,200 tons.

6-32. Airborne, Airmobile, Armored, Infantry, and Infantry (Mechanized) Division Rail Moves

Tables 6-24 through 6-29 show the approximate rail equipment needed to move the personnel and authorized vehicles, equipment, weapons, and supplies for airborne, armored, airmobile, infantry, and infantry (mechanized) divisions. Assumptions contained in paragraphs 6-28 through 6-31 have been used. The specific types of equipment to be used and the detailed makeup of each train must be worked out between the unit transportation officer and the installation transportation officer (continental United States (CONUS))

Table 6-23. Recommended Loading of Typical Vehicles and Equipment on Flat Railcars

1	2	3	4
Line item number	Item	Flatcar (length in ft)	Unit per car
2	D11048 Carr, cgo, ammo.....	40.0	2
3	D11401 Carr, comd and recon.....	40.0	2
4	D11538 Carr, CP.....	40.0	2
5	D12086 Carr, pers.....	40.0	2
6	E02807 Chassis, tlr, 2 ½-ton.....	40.0	2
7	E02670 Chassis, tlr, 3 ½-ton.....	40.0	2
8	E56577 Cbt engr veh, full-tracked.....	40.0	1
9	E39241 Crane, wheel-mtd, 5-ton.....	40.0	1
10	F39378 Crane, wheel-mtd, 20-ton.....	40.0	1
11	H56391 Fftg equip, trk-mtd.....	40.0	1
12	J35561 Genr set, tlr-mtd, PU-407.....	40.0	4
13	J35698 Genr set, tlr-mtd, PU-408.....	40.0	4
14	J41178 Genr set, tlr-mtd, PU-209/MR.....	40.0	4
15	J41315 Genr set, tlr-mtd, PU-294/G.....	40.0	4
16	J41589 Genr set, tlr-mtd, PU-322/G.....	40.0	4
17	J41931 Genr set, tlr-mtd, PU-456/G.....	40.0	4
18	J74852 Grader, rd, mtz.....	56.0	2
19	J93997 Guidance and launching sta.....	46.0	2
20	J96694 Gun, ADA, SP, 20-mm, XM163.....	46.0	2
21	J96819 Gun, twin 40-mm, SP, M42.....	40.0	1
22	K56981 How, 8-in, SP.....	40.0	1
23	K57529 How, 105-mm.....	46.0	2
24	K57666 How, 155-mm, SP.....	46.0	2
25	K57803 How, mdm, 155-mm.....	40.0	1
26	K90188 Instl rep shop, trk-mtd.....	40.0	1
27	L45534 Lchr rkt, 2 ½-ton, 762-mm, trk-mtd.....	40.0	1
28	L76625 Loader, scoop-type, 2 ½-cu yd.....	46.0	2
29	L85146 Lub and svc unit, tlr-mtd.....	50.5	3
30	M68076 Mort, 81-mm, SP, full-tracked.....	40.0	2
31	M68145 Mort, 107-mm, SP, full-tracked.....	40.0	2
32	P11866 Pneumatic tool and compressor outfit, tlr-mtd.....	40.0	2
33	R50543 Recov veh, full-tracked, lt, tlr-mtd.....	40.0	1
34	R50680 Recov veh, full-tracked, mdm.....	40.0	1
35	S70243 Stlr, low-bed, wkr, 12-ton.....	40.0	1
36	S70517 Stlr, low-bed, 25-ton, 4-wheel.....	40.0	1
37	S70791 Stlr, low-bed, 60-ton, 8-wheel.....	50.5	1
38	S72024 Stlr, stake, 12-ton, 4-wheel.....	40.0	1
39	S72983 Stlr, tk, fuel, 5,000-gal.....	40.0	1
40	S73394 Stlr, tk transporter, 50-ton.....	46.0	1
41	S73805 Stlr, van, 6-ton, 4-wheel.....	40.0	1
42	S74079 Stlr, van, cgo, 12-ton.....	40.0	1
43	S74490 Stlr, van, expansible, 6-ton.....	40.0	1
44	T10138 Shop equip, contact maint, trk-mtd.....	40.0	2
45	T10275 Shop equip, elec rep, trk-mtd.....	40.0	1
46	T10275 Shop equip, elec rep, stlr-, tlr-mtd.....	40.0	1
47	T10412 Shop equip, elct rep, stlr-mtd.....	40.0	1
48	T13152 Shop equip, org rep.....	40.0	1
49	T21235 Shop set, acft maint, strl-mtd, A-1, trk-mtd.....	40.0	1
50	T21372 Shop set, acft maint, stlr-mtd, A-2, trk-mtd.....	40.0	1
51	V12826 Tk, cbt, full-tracked, 76-mm.....	40.0	1
52	V13100 Tk, cbt, full-tracked, 105-mm.....	40.0	1
53	W76816 Trac, full-tracked.....	40.0	1
54	W89557 Trac, wheeled, whs.....	40.0	3
55	W94030 Tlr, ammo, 1 ½-ton, 2-wheel.....	50.5	3
56	W94441 Tlr, util, 2 ½-ton, 2-wheel.....	40.0	5
57	W95263 Tlr, cable recl, 3 ½-ton.....	46.0	3
58	W95400 Tlr, cgo, ¼-ton, 2-wheel.....	46.0	4
59	W95537 Tlr, cgo, ¾-ton, 2-wheel.....	46.0	3
60	W95811 Tlr, cgo, ½-ton, 2-wheel.....	46.0	3
61	W96907 Tlr, flatbed, 10-ton, 4-wheel.....	40.0	1
62	W98825 Tlr, tk, water, 400-gal.....	46.0	3
63	X38639 Trk, amb, ¼-ton.....	46.0	3
64	X38776 Trk, amb, ¾-ton.....	40.0	2

Table 6-23—Continued

1	2	3	4
Line item number	Item	Flatcar (length in ft)	Unit per car
65	X38951 Trk, amb, 1 ¼-ton	46.0	2
66	X39735 Trk, ego, ¾-ton	40.0	2
67	X39872 Trk, ego, ¾-ton, WWN	40.0	2
68	X39883 Trk, ego, 1 ¼-ton	46.0	2
69	X40009 Trk, ego, 2 ½-ton	50.5	2
70	X40146 Trk, ego, 2 ½-ton, WWN	50.5	2
71	X40283 Trk, ego, 2 ½-ton, LWB	56.0	2
72	X40831 Trk, ego, 5-ton, LWB	56.0	2
73	X40968 Trk, ego, 5-ton, LWB, WWN	56.0	2
74	X43434 Trk, dump, 2 ½-ton, WWN	46.0	2
75	X43845 Trk, dump, 5-ton, WWN	50.5	2
76	X48846 Trk, lift, fork, 4,000-lb	40.0	10
77	X48914 Trk, lift, fork, 6,000-lb	40.0	8
78	X55627 Trk, platform, utility, ½-ton	40.0	3
79	X56586 Trk, stake, 5-ton	40.0	1
80	X58271 Trk, tk, 2 ½-ton	50.5	2
81	X57408 Trk, tk, 2 ½-ton, WWN	40.0	1
82	X57529 How, 105-mm	40.0	3
83	X59189 Trk, trac, 2 ½-ton	46.0	2
84	X59326 Trk, trac, 5-ton	46.0	2
85	X59463 Trk, trac, 5-ton, WWN	50.5	2
86	X59600 Trk, trac, 10-ton	40.0	1
87	X59874 Trk, trac, 10-ton, WWN	40.0	1
88	X60696 Trk, trac, wrecker, 5-ton	40.0	1
89	X60833 Trk, util, ½-ton	50.5	3
90	X61244 Trk, util, ¼-ton, 4x4	50.5	3
91	X61929 Trk, van, expansible, 2 ½-ton	40.0	1
92	X62237 Trk, van, expansible, 5-ton	40.0	1
93	X62340 Trk, van, shop, 2 ½-ton	50.5	2
94	X62477 Trk, van, shop, 2 ½-ton, WWN	40.0	1
95	X63025 Trk, wkr, crane, 2 ½-ton	40.0	1
96	X63162 Trk, wkr, 2 ½-ton, WWN	40.0	1
97	X63299 Trk, wkr, 5-ton, WWN	40.0	1
98	Y35486 Water purification equip set, trk-mtd	40.0	1
99	Y48255 Welding shop, tlr-mtd	46.0	3
100	Z32391 GM sys, AD, Chaparral, XM48	56.0	2

movements) or the transportation officer in the area in which the movement originates (theater of operation movements). Total figures in tables 6-27 and 6-28 reflect the division base only. Figures for the maneuver battalions are shown in table 6-29. Figures in parentheses in tables 6-27 and 6-28 reflect strengths, flatcars, and boxcars required when the division is equipped with M4T6 rather than class 60 bridging.

6-33. Movement of Troop Units on Foreign Railways

a. The capacity of railroads and railway equipment fluctuates widely throughout the nations of the world. Experience in Europe during World War II indicated that under the pressure of all-out war there are few, if any, places in the world where complete troop units can be moved by rail at the same time that the rail net is supplying a major force. A compromise policy was developed

in which tracked vehicles and foot troops were moved by rail whenever facilities were available and wheeled vehicles, with their normal towed loads, proceeded on highways.

b. Assumed capacities of foreign rail facilities are indicated in (1) through (3) below.

(1) Freight cars.

Well flats	50 tons
Medium flatcars	25 tons
Small flatcars	12 tons
Boxcars	10 tons or 25 troops

(2) Passengers.

Coaches ⁴	40 troops
Sleeping cars ⁴	32 troops

(3) Trains.

Maximum length	40 cars
Maximum net load	400 tons
Maximum troops	1,000 (using boxcars)

⁴ In the forward areas, passenger equipment is seldom used for unit moves. The limited available equipment may be used for movement of casualties, convalescents, redeployment groups, or leave trains.

Table 6-24. Rail Movement—Airborne Division (TOE 57G)

1	2	3	4	5	6	7	8	9
Unit	TOE	Personnel	Flatcars	Boxcars	Coaches	Pullmans	Kitchens	Diners
HHC.....	57-4G	147	21	3	3	5	1	1
Avn bn.....	1-55G	353	37	5	7	11	2	2
Engr bn.....	5-25G	578	99	12	11	18	3	3
Div arty.....	6-200G	1,630	249	31	30	52	7	7
Inf bn (9) (each).....	7-35G	809	54	9	15	25	3	3
DISCOM.....	29-51G	1,660	182	26	31	52	7	7
Sig bn.....	11-215G	549	81	10	10	18	2	2
Armd cav sqdn.....	17-75G	632	83	11	12	20	3	3
HHC, bde (3) (each)....	57-42G	166	17	2	3	5	1	1
MP co.....	19-67G	156	16	2	3	5	1	1
Total.....		13,484	1,305	187	251	421	56	56

Table 6-25. Rail Movement—Airmobile Division (TOE 67T)

1	2	3	4	5	6	7	8	9
Unit	TOE	Personnel	Flatcars	Boxcars	Coaches	Pullmans	Kitchens	Diners
HHC.....	67-2T	166	25	3	3	5	1	1
Avn gp.....	1-100T	1,992	200	29	37	63	8	8
Engr bn.....	5-215T	620	85	12	12	20	3	3
Div arty.....	6-700T	1,848	136	36	34	58	8	8
Inf bn (9) (each).....	7-55T	767	15	14	14	24	3	3
DISCOM.....	29-41T	3,194	243	50	58	100	13	13
Sig bn.....	11-205T	336	45	7	6	11	2	2
Air cav sqdn.....	17-95T	770	76	14	14	24	3	3
HHC, bde (3) (each)....	67-42T	213	19	3	4	7	1	1
MP co.....	19-87T	156	17	2	3	5	1	1
Total.....		16,624	1,019	288	305	523	69	69

Table 6-26. Rail Movement—Armored Division Base (TOE 17G)

1	2	3	4	5	6	7	8	9
Unit	TOE	Personnel	Flatcars	Boxcars	Coaches	Pullmans	Kitchens	Diners
HHC.....	17-4G	197	34	4	4	7	1	1
MP co.....	19-27G	194	34	4	4	6	1	1
Sig bn.....	11-35G	641	122	15	12	21	3	3
Engr bn.....	5-145G	1,017	203	24	19	32	4	4
		(1,019) ¹	(255) ¹	(29) ¹				
HHC, bde (3) (each)....	17-42G	188	29	4	4	6	1	1
Armd cav sqdn.....	17-105G	908	137	17	17	28	4	4
Div arty.....	6-300G	3,083	515	63	56	97	12	12
DISCOM.....	29-21G	7,481	559	66	46	78	10	10
Total.....		9,085	1,691	205	170	287	38	38
		(9,087) ¹	(1,743) ¹	(210) ¹				

¹If equipped with MAB.

Table 6-27. Rail Movement—Infantry Division Base (TOE 7G)

1	2	3	4	5	6	7	8	9
Unit	TOE	Personnel	Flatcars	Boxcars	Coaches	Pullmans	Kitchens	Diners
HHC.....	7-4G	165	31	4	3	6	1	1
MP co.....	19-27G	194	34	4	4	7	1	1
Avn gn.....	1-75G	367	46	6	7	12	2	2
Sig bn.....	11-35G	641	122	15	12	21	3	3
Engr bn.....	5-155G	997	181	22	19	32	4	4
		(999) ¹	(233) ¹	(27) ¹				
HHC, bde (3) (each)....	7-42G	170	27	3	3	6	1	1
Armd cav sqdn.....	17-105G	908	137	17	17	29	4	4
Div arty.....	6-100G	2,785	492	60	51	88	11	11
DISCOM.....	29-1G	2,258	464	55	42	71	9	9
Total.....		8,725	1,588	192	164	284	38	38
		(8,727) ¹	(1,640) ¹	(197) ¹				

¹If equipped with MAB.

Table 6-28—Rail Movement—Infantry Division (Mechanized) Base (TOE 37G)

1	2	3	4	5	6	7	8	9
Unit	TOE	Personnel	Flatcars	Boxcars	Coaches	Pullmans	Kitchens	Diners
2 HHC.....	37-4G	197	33	4	4	6	1	1
3 MP co.....	19-27G	194	34	4	4	6	1	1
4 Sig bn.....	11-35G	641	122	15	12	21	3	3
5 Engr bn.....	5-145G	1,017	203	24	19	32	4	4
		(1,019)*	(255)*	(29)*				
6 HHC, bde (3) (each)...	37-42G	188	32	4	4	6	1	1
7 Armd cav sqdn.....	17-105G	908	137	17	17	29	4	4
8 Div arty.....	6-300G	3,083	515	63	56	97	12	12
9 DISCOM.....	29-11G	2,393	540	63	44	75	10	10
10 Total.....		8,997	1,680	202	183	284	38	38
		(8,999)	(1,732)	(207)				

*If equipped with MAB.

Table 6-29. Rail Movement—Combat Units

1	2	3	4	5	6	7	8	9
Unit	TOE	Personnel	Flatcars	Boxcars	Coaches	Pullmans	Kitchens	Diners
2 Inf bn, inf div.....	7-15G	849	69	15	16	27	3	3
3 Inf bn (mech), armd div, inf div (mech).....	7-45G	924	73	16	17	29	4	4
4 Tank bn, inf div, armd div, inf div (mech)...	17-35G	599	92	11	11	16	2	2

6-34. Troop Movement Planning

a. *Scales.* In training and preparing for movement, all units will become familiar with the use of railway car loading scales or equivalent scales, tables, or templates (para 6-36).

b. *Rail Movement Table.* All units will maintain tables for movement by *all means* of transportation. A sample rail movement table is provided in table 6-30. This table can be adapted to any type of unit. It is maintained by the division transportation section and by lower units in compliance with AR 220-10. The road movement table is revised to reflect actual strength and equipment on hand on receipt of movement orders. Organizational equipment and checkable baggage must be listed separately.

c. *Types of Tables.* When the rail movement has been ordered and the approximate types of equipment have been requested, each unit prepares the following:

- (1) Train consist table (table 6-31).
- (2) Entraining table (table 6-32).
- (3) Individual train-loading plan (fig. 6-2).

d. *Alert Time — (CONUS).* An alert is not an order, and rail carriers do not move equipment into position for loading on an alert. It requires 96 hours after request for routing has been placed with the Military Traffic Management and Terminal Service (MTMTS) to start loading a

division, assuming that no equipment is available at the installation.

e. *Loading Time — (CONUS).* Passenger trains require 1 hour for loading. Baggage cars for personal baggage and baggage cars for kitchen purposes are spotted in advance. The time required to load troop units with all vehicles and equipment on freight trains varies with the training status of the unit and the conditions at the loading point. Six hours is used for planning purposes.

6-35. Railway Car Loading Templates

In preparing loading plans and determining flat-car requirements, car loading templates are helpful. The first step is to prepare templates to a suitable scale (1:25 is recommended) for each item of equipment to be loaded. The transportation officer, or representative of the commercial carrier, can provide dimensions of the usable loading space of the various pieces of rolling stock that can be furnished. A diagram of the usable loading space is then drawn to the same scale as the equipment templates. By placing the templates over the usable loading space, the most economical car loading arrangements can be determined. Configurations for both tactical and administrative shipment of many items of military equipment are contained in TB 55-46. Tables 6-30 and 6-31 provide sample train consist and entraining tables.

Table 6-30. Sample Rail Movement Table

Table 6-30. Sample Rail Movement Table																										
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
	TOE	Unit	Strengtb		Organiza- tional equipment		Checkable baggage		Vehicles and equipment per unit								Railway car requirements per unit									
									Standard vehicles						Special equipment		Passenger			Freight						
			Trailers			Trucks			Coach	Pullman		Boxcar					Flatcar									
			Off and WO	EM	Pieces	Weight	Pieces	Weight	Trailer, amph, cargo, ¼-ton 4-ft wide 9-ft long	Etc.	Etc.	Truck, utility, ¼-ton, 4x4 5-ft wide 11.5-ft long	Etc.	Etc.	Items	Shipping length (ft)	48 men	Std number of sec (2 sec)	Tour number sec (3 sec)	Kitchen baggage	Organizational equipment	Checkable baggage	40-ft	42-ft	46-ft	50-ft
2																										
3																										
4																										
5																										
6																										
7																										
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- Notes. 1. This table can be adapted to any type of unit; the number of lines and columns will vary with the type of unit.
2. The division transportation section should keep current a tentative table, in compliance with AR 220-10. Subordinate and separate units should maintain similar tables.
3. Upon receipt of movement order, the table will be revised to reflect actual strength and equipment on hand and to conform to the provisions of the movement order.
4. Organizational equipment and checkable baggage must be listed separately.

Table 6-31. Sample Train Consist Table

Table 3-311 Sample Train Consist Form										
1	2	3	4	5	6	7	8	9	10	
1	Train number	Transportation groupings	Coach	Pullman		Kitchen or kitchen- baggage	Boxcar	Flat and gondola	Total	Train officers
				Standards	Tourist					
2	1	-----								CO Mess off Surg
3	2	-----								CO Mess off Surg
4	3	-----								CO

- Notes: 1. Upon receipt of movement order, commanding general will designate the order in which units will be forwarded.
 2. Train consist table is prepared by division transportation section from data appearing on revised rail movement table.
 3. Maximum and minimum length of trains (total number of freight and passenger cars) will be prescribed by the origin railroad.
 4. Under "transportation grouping," show units that will comprise each individual train.
 5. Under "train officers," show by name the officers assigned to each train.

Table 6-32. Sample Entraining Table

1	2	3	4	5	6	7	8	9	10	11
1	Train number	Main number	Order depart	Loading		Departure		Arrival		Entraining officer
				Point	Date	Hour	Date	Hour	Date	Hour
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										

- Notes: 1. Upon completion of train consist table and individual train loading plan, division transportation section will prepare this entraining table.
 2. "Train number" will be shown on train consist table.
 3. In CONUS, the "main number," which authorizes the movement of each train, will be issued by the Military Transportation Section, Association of American Railroads, through the Military Traffic Management and Terminal Service, Washington, D.C., to the local transportation officer, who will furnish main number to division transportation section. In theaters of operation the main number normally will be issued by the TASCOTM transportation officer.
 4. Entraining officers will be designated by name.

6-36. Individual Train-Loading Plan

a. The division transportation section prepares this plan (fig. 6-2). Copies should be furnished to —

- (1) Troop commanders.
- (2) Officer in charge of troops (train).
- (3) Entraining officers.
- (4) Motor park dispatcher so that vehicles will arrive at entraining point in the order that they will be loaded on railway cars.
- (5) Local transportation officer.

b. In each block, indicate by symbol the specific personnel and equipment assigned to each car.

c. In each block representing an open-top freight car (flatcar or gondola car), indicate by symbol the equipment specifically assigned to each car.

d. In the space provided at the bottom of the plan, assign all cars (freight and passenger) by block numbers (not by railroad car initials and numbers) to the specific units that will occupy them.

Division _____

Train number _____ Main number _____

Assignment of Personnel and Equipment to Individual Railway Cars

Front

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	Continue to last car				rear

Suggested Symbols for Equipment and Vehicles

Equipment	Symbol	Equipment	Symbol	Equipment	Symbol	Equipment	Symbol
Coach _____	CH	Box _____	BX	Howitzer, 105-mm	HL		
Pullman, standard	SP	Truck, ¼-ton	TJ	Howitzer, 155-mm	HM		
Pullman, tourist	TP	Trailer, ¼-ton	TQ				
Troop sleeper	TS	Truck, 2½-ton	TC				
Kitchen car	K	Motorcycle	MC				
Kitchen baggage	KB						

Assignment of Units to Cars (by Block Numbers Above)

Unit	Block number	Unit	Block number	Unit	Block number

Figure 6-2. Individual train-loading plan.

Section IV. MOTOR TRANSPORT

6-37. Motor Transport Operations

a. Motor transport operations in support of forces in a theater of operations are generally either local or line hauls.

(1) Local hauls are characterized by low running time in relation to loading and unloading time. These hauls normally involve a number of trips per day and are evaluated on the basis of tons moved during the operational period. The method of operation predominantly used in local hauls is the shuttle or a series of round trips made by the same vehicles between two specified points. Port and beach clearance, installation support operations, transfer operations, and field support operations are all readily adaptable to local haul.

(2) Line hauls are characterized by high running time in relation to loading and unloading. These hauls normally involve one trip or a portion of a trip per day. The most common method of operation used in line haul is the relay — transporting supplies or troop in continuous movement without transfer of load. This is accomplished by a change of truck-tractors or drivers. Intersectional motor transport service requirements are generally accomplished with line haul.

b. Other terms used in conjunction with motor transport operations are —

(1) Direct haul.

(2) Piggyback (or trailer or flatcar (TO-FC)).

(3) Roll-on/roll-off.

(4) Highway movement.

(5) Off-road movement.

(6) Highway regulation (planning, scheduling, routing, and directing the actual use of a military road maneuver network by vehicular and foot traffic).

c. See FM 55-30 for details on motor transport service in theaters of operations.

6-38. Planning Factors

a. Because of the varied services performed, the different loads carried, and different terrain over which motor transport operations are conducted, planning factors should be used with caution and applied only in the absence of specific data on the local situation. (For classified motor transport planning factors, see FM 101-10-3.)

b. The following factors are used in motor transport planning for computing truck and truck company requirements in the absence of specific data:

(1) Vehicle availability — the average number of task vehicles not in maintenance and therefore available for daily operations out of the total task vehicles assigned to a truck unit.

(a) Operational short range..... 83 percent.

(b) Long-range planning..... 75 percent.

(2) Vehicle payload — the anticipated payload per vehicle (table 6-33). The following are rules of thumb only:

(a) Off-road — rated capacity of vehicle.

(b) Highway — rated capacity plus 50 percent for trailers or semitrailers and 100 percent for tactical wheeled vehicles.

(c) For planning highway moves, table 6-33 shows in column 4 the average tons that can be hauled by the various capacity vehicles.

(3) Trips per day — the daily round trips that a vehicle averages. These vary with running time and loading and unloading time. The following are general averages only:

(a) Line haul — two per day.

(b) Local hauls — four per day.

(4) Length of haul — the one-way distance that cargo is to be hauled, from which round-trip distance may be computed. The following are rules of thumb only:

(a) Line haul — 160 kilometers one way.

(b) Local haul — 25 kilometers one way.

(5) Rate of movement — the average number of kilometers covered in an hour, including halts during the period of movement. For long-range planning, the following estimates may be used:

(a) Poor roads — 16 kilometers in the hour.

(b) Good roads — 25 kilometers in the hour.

(6) Turnaround time — the time consumed in loading, unloading, and moving from origin to destination and return to origin.

(7) Loading and unloading time — time consumed per turnaround in loading and unloading areas, including time waiting, spotting, documenting, and handling of cargo on and off vehicles. The following are loading and unloading times for loose cargo:

(a) Trucks — 2.5 hours per round trip.

(b) Semitrailers in relay operation — 1 hour per relay; 2.5 hours' loading and unloading time per round trip.

(c) Truck-tractors in relay operations — 1 hour per relay.

(8) Operational day — the number of hours per day in which vehicles with drivers normally are employed.

(a) One shift — 10 hours.

(b) Round the clock — 20 hours.

(9) Unit lift and daily lift — unit lift is the amount of cargo a truck unit is expected to move at one time; daily lift is that which the unit can move in a day with a number of trips (table 6-34).

(10) Ton-kilometers and passenger kilometers — the product of the number of tons or passengers and the actual distance that they were moved.

c. Table 6-33 gives vehicle payload capacities. Passenger capacity is based on an allowance of 18 inches per man, excluding driver and assistant driver. No allowance is made for individual field equipment in automobiles and ambulances. Passengers are not carried in semi-trailers and dump trucks except in emergencies. Types of semi-trailers not generally used in off-road operations are gasoline, refrigerator, 12-ton van, and tank transporter.

Table 6-83. Vehicle Payload Capacities for General Planning

1	Line item number	2 Nomenclature	3 Off road (tons)	4 Highway average (tons)	5 Highway maximum (tons)	6 Towing capacity (tons)		8 Passengers	9 Cargo space
						Highway	Cross country		
2	B04441	Automobile, sedan, lt.....						4	-----
3	C39696	Bus, 37-pax.....						37 (or 18 litters)	-----
4	D11048	Carr, cgo, tracked, 6-ton, M548.....						11	-----
5	D12086	Carr, pers, full-tracked, armd.....							-----
6	S70106	Stlr, low-bed, 12-ton, 25-ft.....	12	16	18				200 sq ft
7	S70380	Stlr, low-bed, 15-ton, 4-wheel.....	25	16	25				320 sq ft
8	S70517	Stlr, low-bed, 25-ton, 4-wheel.....	25	25	30				-----
9	S70791	Stlr, low-bed, 60-ton, 8-wheel.....	60	60	60				204 sq ft
10	S71613	Stlr, reefer, 7 1/2-ton, 2-wheel.....	6	6	7.5				790 cu ft
11	S71887	Stlr, stake, 6-ton, 2-wheel.....	6	9	9			24	1,130 cu ft
12	S72024	Stlr, stake, 12-ton, 4-wheel.....	17.2	25.2	25.2				2,100 cu ft
13	S72161	Stlr, stake, 20-ton, 34-ft.....	20	18	24			65	1,400 cu ft
14	S72846	Stlr, tk, gas, 5,000-gal, 4-wheel.....	3,000 gal	5,000 gal	5,000 gal				-----
15	S73394	Stlr, tk transporter, 50-ton, 8-wheel.....	50	40	50				-----
16	S73805	Stlr, van, cgo, 6-ton, 2-wheel.....	6	9	9			24	1,020 cu ft
17	S73942	Stlr, van, 20-ton, 34-ft.....	20	18	24			65	1,349 cu ft
18	S75038	Stlr, van, shop, 6-ton, 2-wheel.....	6	8	8				1,675 cu ft
19	S75175	Stlr, van, 12-ton, 4-wheel.....	12	18	18			50	1,342 cu ft
20	W95537	Trk, cgo, 3/4-ton, 2-wheel.....	.75	1.1	1.1				175 cu ft
21	X38639	Trk, amb, frontline, 1/4-ton, 4x4.....						4 (or 3 litters)	-----
22	X38776	Trk, amb, 3/4-ton, 4x4.....						8 (or 5 litters)	-----
23	X39735	Trk, cgo, 3/4-ton, 4x4.....	.75	1	1.5	2		8	160 cu ft
24	X40009	Trk, cgo, 2 1/2-ton, 6x6.....	2.5	4	5	5	3	20	408 cu ft
25	X40381	Trk, cgo, 5-ton, 6x6 (single tires).....	5	6	7.5	15	7.5	20	513 cu ft
26	X41105	Trk, cgo, 5-ton, 6x6 (dual tires).....	5	6	10	15	7 1/2	20	513 cu ft
27	X41790	Trk, cgo, 10-ton, 6x6.....	10	10	15	25	15		496 cu ft
28	X43297	Trk, dump, 2 1/2-ton, 6x6.....	2 1/2	4	5	5	3	20	67.5 sq ft
29	X43845	Trk, dump, 5-ton, 6x6.....	5	7 1/2	7 1/2	15	7 1/2	15	135 cu ft
30	X57271	Trk, tk, gas, 2 1/2-ton, 6x6.....	800 gal	1,200 gal	1,200 gal				-----
31	X58367	Trk, tk, water, 2 1/2-ton, 6x6.....	600 gal	1,000 gal	1,000 gal				-----
32	X61107	Trk, util, 1/4-ton, 4x4.....	0.4	0.4	0.6	1	3/4	4	66 cu ft
33	X62006	Trk, van, shop, 2 1/2-ton, 6x6.....	2 1/2	2 1/2	2 1/2	4	3		-----
34	X62340	Trk, van, shop, 2 1/2-ton, 6x6.....	2 1/2	3 1/2	3 1/2	4	3		-----

Table 6-34. *Truck Unit Capability Estimates for Long-Range Planning*
a. Local Haul—STON Per Day (Highway)
 (Vehicle availability $\times$ average tons per vehicle $\times$ trips per day.)

1	2	3
Unit	Computation	STON per day
2 Light trk co (2½-ton trk).....	45 $\times$ 4 $\times$ 4 =	720.
3 Light trk co (5-ton trk).....	45 $\times$ 6 $\times$ 4 =	1,080.
4 Medium trk co (stlr).....	45 $\times$ 12 $\times$ 4 =	2,160.
5 Medium trk co (petrl) (stlr).....	45 $\times$ 5,000 $\times$ 4 =	900,000 gal per day.
6 Medium trk co (reefer, 7½-ton).....	45 $\times$ 6 $\times$ 4 =	1,080.
7 Heavy trk co (stlr, tank transporter).....	18 $\times$ 40 $\times$ 4 =	2,880.

b. Line Haul—STON Per Day (Highway)
 (Vehicle availability $\times$ average tons per trip $\times$ trips per day.)

1	2	3
Unit	Computation	STON per day
2 Light trk co (2½-ton trk).....	45 $\times$ 4 $\times$ 2 =	360.
3 Light trk co (5-ton trk).....	45 $\times$ 6 $\times$ 2 =	540.
4 Medium trk co (stlr).....	45 $\times$ 12 $\times$ 2 =	1,080.
5 Medium trk co (petrl) (stlr).....	45 $\times$ 5,000 $\times$ 2 =	450,000 gal per day.
6 Medium trk co (reefer, 7½-ton).....	45 $\times$ 6 $\times$ 2 =	540.
7 Heavy trk co (stlr, tank transporter).....	18 $\times$ 40 $\times$ 2 =	1,440.

6-39. Computing Truck Unit Requirements

a. The following formulas may be used for motor transport planning:

(1) *One-lift hauls.* To determine the number of truck companies required to move a given number of tons in one lift, use the following formula:

$$\frac{\text{Tons to be lifted}}{\text{tons per vehicle} \times \text{vehicle availability per company}} = \text{truck companies required}$$

Example: To determine the number of transportation light truck companies required to move 2,700 STON in one lift
When: 2,700 = tons to be lifted.

$$\frac{2,700}{4 \times 45} = 15 \text{ transportation light truck companies required}$$

4 = tons per truck, 2½-ton 6 $\times$ 6
 45 = vehicles available per company

Note. If the number of vehicles required is desired rather than the number of truck companies, omit the vehicle availability factor in the formula.

(2) *Sustained haul in one continuous operation.* In most operations, there is a continuous flow of supplies forward from dumps, depots, beaches, or terminals. In such cases, tonnage move forward only, and trucks return for another load. The average turnaround time required by the truck units to complete the round trip must be considered. Turnaround time is computed by dividing the round-trip distance by rate of movement and adding delays. Thus, turnaround time = $2 \times \frac{\text{distance}}{\text{rate}} + \text{delays}$. The applicable formula

for sustained operations becomes —

$$\frac{\text{Daily tonnage forward} \times \text{turnaround time}}{\text{tons per vehicle} \times \text{vehicles available per company} \times \text{operating time per day}} = \text{truck companies required}$$

Example: To determine the number of transportation medium truck companies equipped with 12-ton cargo semitrailers required to haul 4,800 STON per day 240 kilometers from point A to B, using the semitrailer relay method of operation, when—

Rate = 20 kilometers in the hour

Delay = 2 hours per round trip

The turnaround time becomes —

$$2 \times \frac{240}{20} + 2 \text{ } ^1\text{h} = 32 \text{ hours}$$

To complete the example when —

Tons per vehicle = 12

Vehicles available per company = 50 (at least two trailers per tractor are assumed)

Operating time per day = 20 hours

The formula becomes—

$$\frac{4,800 \times 32}{12 \times 50 \times 20} = 12.8 \text{ or } 13 \text{ medium truck companies required}$$

b. Formulas similar to those in *a* above can be used to compute requirements for troop movements or for hauling bulk liquid by using the number of persons or gallons respectively rather than STON.

c. Through study and analysis of intelligence reports or the actual survey of road conditions in an area of operations, the highway planner may develop good reason for assuming that the planning factors as shown may be changed. He should, therefore, be in a position to alter his assumptions, computations, and the resulting requirements.

¹ Relay time (6 hours) computed as 1 hour required for each relay operation and a relay required at each end of a segment of a relay operation. In the problem, the distance (240 kilometers) was divided into 3 equal segments of 80 kilometers. Hence, $3 \times 2 = 6$.

6-40. Highway Tonnage Capabilities

a. In selecting the routes over which cargo is to be hauled, the planner must consider the capabilities of the roads and bridges to sustain the operation. The gross weight of the heaviest loaded vehicle should not exceed the rated tonnage capacity of the weakest bridge, unless it is determined that such bridge or bridges will be strengthened. To determine the exact tonnage capabilities of highways for sustained operations is difficult because of the number of varying conditions that prevail. Also, the volume of tactical, administrative, and indigenous traffic to be accommodated on supply routes may exceed the number of cargo-hauling vehicles, which further restricts the capabilities of motor transport.

b. Table 6-35 may be used as a guide in the absence of more accurate data for estimating the supply support tonnage capabilities of highways under varied conditions, assuming that operations are sustained, adequate road maintenance is provided, and each road bears two-way traffic. In using the reduction factors, when more than one limiting feature is involved, apply the narrow

roadway factor first; then to the new capability apply one of the next three on terrain; and finally, to the latter adjustment, apply the weather factor if the conditions are for a sustained period. All reduction factors are maximum under extreme conditions. Columns 5 to 9 in table 6-35 define the various conditions of roadway, terrain, and weather and provide a guide for estimating incremental reductions in highway tonnage capabilities associated with deviations from standard conditions.

c. Planned tonnage movement should not exceed the capability of any portion of the road net to be used, unless reconstruction or heavy maintenance is provided to increase the capability of the section of highway or bridge to meet the demands. Otherwise, alternate routes must be selected to distribute the load. If no alternate route is available and the indicated tonnage is not reduced, the highway or bridge can be expected to deteriorate rapidly and disrupt any sustained operation. (Maintenance vehicles and personnel on a road may also interfere with the flow of traffic and thereby limit capability.)

Table 6-35. Highway Tonnage Capabilities

	1	2	3	4	5	6	7	8	9
		Daily tonnage forward			Reductions applicable to various conditions				
1	Type of highway	Optimum dispatch route only (STON)	Supply traffic communica- tions zone (STON)	Supply traffic combat zone (STON)	Narrow road way (percent- age)	Rolling terrain (percent- age)	Hilly terrain with curves (percent- age)	Mountain- ous ter- rain (per- centage)	Seasonal bad weather (percent- age)
2	Concrete.....	60,000	36,000	8,400	25	10	30	60	20
3	Bituminous.....	45,000	27,000	7,300	25	10	30	60	30
4	Bituminous-treated....	30,000	18,000	5,800	25	20	40	65	40
5	Gravel.....	10,150	6,090	3,400	25	20	50	70	60
6	Dirt.....	4,900	2,940	1,600	25	25	60	80	90

Section V. AIR

6-41. Movement by Air Force Aircraft

a. General

(1) Table 6-3 may be used as a general guide to determine the aircraft requirements, by type of Air Force transport aircraft, for air movement of divisional and nondivisional units that might be in a typical field army (para 1-6). FM 57-1, FM 57-35, and FM 61-100 contain aircraft requirements for air movement of airborne or airmobile units. Paragraph 6-45 contains data to compute aircraft requirements to transport Army aircraft in Air Force transport aircraft. The following tables are based on data compiled for a theoretical situation that assumes full TOE strength and complete TOE equipment.

In applying these tables to actual air movement, the user should remember that the required lift for any unit will fluctuate with the personnel and equipment status of that unit and with the allowable cargo load of the aircraft for the specific operational conditions of the air movement. The tables show numbers of aircraft load, i.e., the number of sorties, by type of aircraft, required to move a particular unit. Fewer aircraft than shown may transport the unit if part or all of the aircraft fly more than one sortie.

(2) The air movement of a large body of troops normally involves departures from several airfields and, in air-landed operations, concurrent landing at several terminal airfields, air-landing

facilities, or landing zones in the objective area. The availability of transport aircraft, air installations, and base facilities; the urgency of the situation; and enemy capabilities are major factors in determining the number of installations employed and the number of sorties to be flown by the transporting aircraft. FM 100-5 and FM 101-5 provide general considerations and procedures governing the employment of air transportation. TM 55-450-15 contains specific information regarding load planning, determination of aircraft requirements, and forms relative to air movement.

b. Aircraft Requirements — Field Army Units.

(1) *General.* The tabulated data in table 6-3, represent aircraft requirements for selected units of a typical field army. For planning, all units are moved at 100-percent personnel and equipment TOE strength. The company (battery, troop) is treated as if it were on an independent mission, e.g., in the table 6-3 figures of aircraft requirements, no company-size unit is combined with another unit. In other words, each aircraft will have on it one or part of one company size unit together with its personnel, equipment, and supplies of all 10 classes, as appropriate.

(2) *Aircraft requirements.*

(a) Aircraft requirements listed in table 6-3 reflect the number of sorties required to transport the various units of company (troops, battery) size.

(b) The following assumed allowable cargo loads (2,000 nautical-mile range) are the bases for aircraft requirements:

	Pounds
C-130 medium transport airplane.....	30,000
C-124 heavy transport airplane.....	35,000
C-141 heavy transport airplane.....	70,000

(c) In determining aircraft requirements, the "type load method" (TM 57-210) has been used. Units have been loaded administratively rather than tactically.

(d) Air Force troop carrier units providing aircraft for the operation being considered will announce to the Army component of the airborne force the allowable cargo load for each type of aircraft to be employed; the allowable cargo load will vary with the distance of flight and other operational conditions.

(e) In any airborne operation, types of aircraft other than those listed may have to be used. However, the data given will serve as a basis for adaptation of the units to be moved to the types of aircraft that are available.

(f) Table 6-3 indicates three types of

combinations of aircraft. Other types of combinations may be necessary.

1. Combination 1 consists of C-130's and C-124's. In determining aircraft requirements for this combination, the minimum required number of C-124's has been used; i.e., items of equipment that cannot be carried in C-130's (either too heavy or too large) have been loaded in C-124's. After filling typical loads for the C-124's, the remainder of the unit's personnel, equipment, and supplies has been loaded into C-130's. All equipment considered in the three sample combinations presumably is fully assembled (except the outsize equipment). There is an allowance for 9-inch clearances on both sides and top of loads at the door section.

2. Combination 2 consists of C-124's solely.

3. Combination 3 consists of C-141's and C-124's.

The minimum number of C-124's to take care of loads not capable of being loaded on the C-141 has been employed. The remainder of the loads has been loaded into C-141's.

4. Table 6-36 lists items transportable only by C-5A. In addition, helicopters, if partially disassembled, may be transported by C-5A.

(g) In selecting aircraft or combinations of aircraft to transport a unit, the planner must carefully consider the primary mission of the unit and the requirement for the unit in the objective areas. During the initial stages of an airborne assault, units transported to the objective area will use a combination of parachute and assault aircraft. Following the initial assault and after units have prepared landing facilities, medium transport aircraft can perform an air-landed role. When facilities are developed sufficiently to handle heavy transport aircraft, units requiring this means of transportation can come into the objective area.

(h) FM 101-10-3 contains supplemental classified data on airlift requirements for field artillery units with nuclear capabilities, air defense units, and nuclear weapon and missile support units.

(3) *Tabulated requirements.* In table 6-3 when combinations of units are moved, savings on total aircraft requirements can be accomplished. This table does not reflect this saving; it reflects the minimum aircraft necessary to move each indicated unit of company size, independent of any other unit. A sample calculation is provided in table 6-3 for the aviation battalion (TOE 1-75G) using latest Department of the Army-approved factors for Europe, in pounds per man per day.

Table 6-36. TOE Items Transportable by C-5A Only
a. Items Too Heavy for C-130, C-124, or C-141 Aircraft

1	Line item number	Item	Weight (STON)	Dimensions (ft)		
				Length	Width	Height
2	E56577	CEV, full-tracked (T118E1).....	53.0	26.0	12.2	10.9
3	L43664	Lchr, M60-series tk chassis, trans 40- and 60-ft brg, type cl 60.....	41.5	39.0	12.0	7.9
4	R50680	Recov veh, full-tracked, mdm (M88)---	54.0	27.2	11.5	9.9
5	V12826	Tk, cbt, full-tracked, 76-mm gun (M41A1).....	43.1	30.7	10.7	9.5
6	V13100	Tk, cbt, full-tracked, 105-mm gun (M60)	48.5	26.7	11.9	10.3

b. Items Too Large for C-130, C-124, or C-141 Aircraft

1	Line item number	Item	Weight (STON)	Dimensions (ft)		
				Length	Width	Height
2	C20414	Brg, armd-veh-launched, scissor-type, cl 60, aluminum, 60-ft long.....	15.4	36.3	13.2	13.3
3	C22469	Brg, ferry unit, end bay, amph, mbl, flt, aslt.....	9.7	37.0	12.0	11.7
4	C22606	Brg, ferry unit, interior bay, amph, mbl, fltg, aslt.....	7.2	26.0	12.0	10.5
5	C25620	Brg, fltg, mbl, aslt, amph.....	26.6	36.1	10.0	10.3
6	F39241	Crane, wheel-mtd, 5-ton $\frac{3}{8}$ -cu yd, diesel, 4x4, rough terrain.....	14.5	23.1	10.0	11.0
7	F39378	Crane, wheel-mtd, 20-ton, $\frac{3}{4}$ -cu yd, rough terrain.....	30.5	28.5	11.5	12.3
8	J30766	Genr and chg plant, acetylene, stlr- mtd, 750 cfh.....	15.6	33.4	8.4	11.4
9	J97230	Gun, FA, SP, 175-mm (M107).....	26.4	37.2	10.5	9.3
10	K56981	How, hv, SP, 8-in (M110).....	26.8	22.1	10.5	9.3
11	K57666	How, mdm, SP, 155-mm (M109).....	24.7	20.0	10.8	9.2
12	K57255	How, lt, SP, 105-mm (M108).....	22.7	20.1	10.8	9.2
13	R11462	Ramp, loading, veh, mbl, aslt, amph, flt brg.....	27.1	39.3	10.0	11.7
14	R50543	Recov veh, full-tracked, lt armd (M578)	23.8	21.8	10.5	9.7
15	S70791	Stlr, low-bed, 60-ton, 8-wheel, with equip.....	16.8	36.8	12.0	6.8
16	S73394	Stlr, tk trans, 50-ton, 8-wheel, with equip.....	21.2	38.5	12.2	8.8
17	S74490	Stlr, van, expansible, 6-ton, 4-wheel, with equip.....	7.5	26.9	8.2	11.2
18	W76816	Trac, full-tracked, low-spd, diesel, hv DBP, with bulldozer, with scarifier winch.....	22.0	-----	-----	-----
19	X59600	Trk, trac, 10-ton, 6x6, with dual mid- ship winch, with high-mtd 5th wheel, with equip.....	14.5	24.1	9.5	9.3

For convenience, company-size requirements are aggregated into battalion size, without, however, reflecting any savings as noted above.

6-42. Air Terminals

a. *General.* Air terminals provide facilities for loading and unloading aircraft and for intranet handling of personnel and cargo that are moved by aircraft.

b. Responsibilities.

(1) *Air Force.* The Air Force selects, prepares, and operates air terminals, exclusive of airfields or landing areas operated by and for Army aviation units.

(2) *Army.* The Army provides engineer service support to air terminals, to include construction and maintenance other than repairs and utilities.

c. Operations.

(1) *General.* The theater air force provides aerial port squadrons to operate air terminals. Theater army may establish facilities and station personnel at an air terminal in a tenant status to perform those functions agreed on by the theater army and theater air commanders.

(2) *Aerial port squadrons.* An aerial port squadron is a cellular-type Air Force organization. The assigned mission determines its use and

its strength. These units provide passenger and cargo-handling capabilities, to include manifesting, warehousing, loading, unloading, tiedown, preparation for air delivery, and ejection in flight. One aerial port squadron can perform any one of the following tasks:

(a) Handle 480 tons of cargo per 8-hour day in an air-landed operation.

(b) Rig for delivery by parachute and load 280 tons of cargo per 8-hour day when the packing of parachutes is not required.

(c) Rig for delivery by parachute, pack parachutes, and load 112 tons of cargo per 8-hour day.

(3) *Army quartermaster air delivery companies (TOE 10-407)*. These units are stationed at selected air terminals or at Army logistic installations to prepare cargo for parachute or freedrop delivery. TOE 10-407 and FM 101-10-2 list the capabilities of this company.

(4) *Volume*. The volume of cargo and passenger traffic at an Army airfield may require assignment of a unit to perform these operations. Units that may be employed include the quartermaster air delivery company or teams from TOE 10-500 transportation terminal transfer company (TOE 55-118) or the terminal contract supervision detachment and the cargo documentation section from TOE 55-500.

d. Airfield Capabilities.

(1) The following criteria establish the maximum number of aircraft that can be based on an airfield or landing strip. Dispersion requirements may dictate decreased utilization of such facilities.

(a) Improved airfields in rear of the combat zone can serve as a base for a maximum of two wings. Under ideal conditions, aircraft land or take off at 3-minute intervals, and 1 hour on the ground is required for each landing for necessary servicing, reloading, and inspection.

(b) Unimproved airfields and landing strips in rear of the combat zone can serve as a base for approximately one wing.

(c) Transport aircraft normally are not based in the combat zone. On airfields in the combat zone, aircraft land or take off at 3-minute intervals under ideal conditions, and the time required on the ground is reduced to 30 minutes. Service and maintenance are limited to emergency requirements only, and the tactical situation normally does not permit more time than that required for actual unloading and reloading.

(2) For transport aircraft use, airfields in rear of the combat zone should be operational

day and night. Airfields in the combat zone may be operational only during daylight hours, depending on the enemy air capabilities.

(3) The capabilities of aerial port squadrons also influence traffic potential of airfields.

6-43. Air Movement of Materiel

a. General. Supplies may be airdropped or air-landed. Airdrop methods include container loads prepared for high- or low-velocity rates of descent and free fall and platform loads. Container loads are limited to supply items and to individual container weights between 250 and 2,200 pounds. Platform loads may consist of supplies or equipment. The smallest platform is 9 feet wide by 8 feet long. All airdrop platforms must be loaded to meet a minimum weight of 35 pounds per square foot. The maximum platform weight, using current standard procedures, is 25,000 pounds. Free-fall techniques are limited to smaller loads capable of withstanding extremely high ground-impact forces.

b. Airlift Capabilities. The payload capability of each aircraft related to the mission-flight profile and other affecting variables is provided by the supporting airlift commander. The supported commander is not responsible for computing payload capabilities and he is not expected to do so. Airdrop capabilities are controlled by the airdrop system's limitations, not by the payload of the aircraft. Thus, the 25,000-pound limit for airdrop is related to the airdrop system, not to the aircraft.

6-44. Army Aircraft

a. General. Both fixed-wing and rotary-wing Army aircraft are employed to move cargo, personnel, and equipment. Performance standards are affected by many variables, such as load/fuel, altitude temperature, humidity, existing weather, airfield characteristics, and individual aircraft characteristics. The weight-lifting capabilities of all aircraft are particularly dependent on air density or density altitude, which is composed of three variables — altitude, temperature, and humidity. As air density decreases, lift capability decreases. Wind can materially affect operations; and in operations requiring long ranges or maximum lift capabilities, wind may become a critical factor. Payloads may be increased or decreased because of variations in radius or range, density, altitude, and wind velocity. The Army aviation staff officer should be consulted for accurate, detailed computations to meet specific requirements.

b. Rotary-Wing Aircraft.

(1) *General.* Army rotary-wing aircraft

(helicopters) are limited in speed and range as compared with fixed-wing aircraft. However, their capability to land and take off vertically permits the delivery of personnel and materiel to areas of operations inaccessible to fixed-wing aircraft and the evacuation therefrom. Likewise, their capability for flight at relatively slow speeds permits continued operations under weather conditions of low ceiling and restricted visibility.

(2) *Planning factors (rotary-wing).*

(a) *Availability.* The number of helicopters available for a mission at any one time depends on the status of maintenance and inspections on the helicopters in the unit. Experience indicates that two-thirds (67 percent) of the helicopters assigned to a unit are available for flying during continuous operations. Normally, a higher percentage of assigned aircraft will be operational for missions of short duration, depending on variables such as previous operational commitments, status of maintenance and inspections, type of aircraft, availability of repair parts, and operational environment.

(b) *Cargo.* The dimensions of cargo are

restricted only by the size of the aircraft's cargo compartment doors and/or the system used to carry the cargo externally, assuming, of course, that the weight of the package or packages does not exceed the weight limitations for the aircraft under prevailing conditions (fig. 6-3 through 6-8). Typical items of cargo for internal loading are boxes of rations, ammunition, signal equipment, vehicle and aircraft parts, and supplies. Loads too large to fit into the cargo compartment, but under the maximum weight permissible for external loads, may be carried slung under the helicopter to expedite loading and unloading.

(c) *Landing facilities.* Provisions must be made for adequate landing sites in planning helicopter movements. The minimum requirements for landing sites are as given below. However, larger areas with cleared approaches are highly desirable to improve safety margins of operation (see table 7-30).

OH-23, OH-13, OH-6.....	18 meters by 18 meters
UH-19, UH-1.....	28 meters by 28 meters
CH-21, CH-34.....	28 meters by 46 meters
CH-37, CH-47, CH-54.....	46 meters by 64 meters

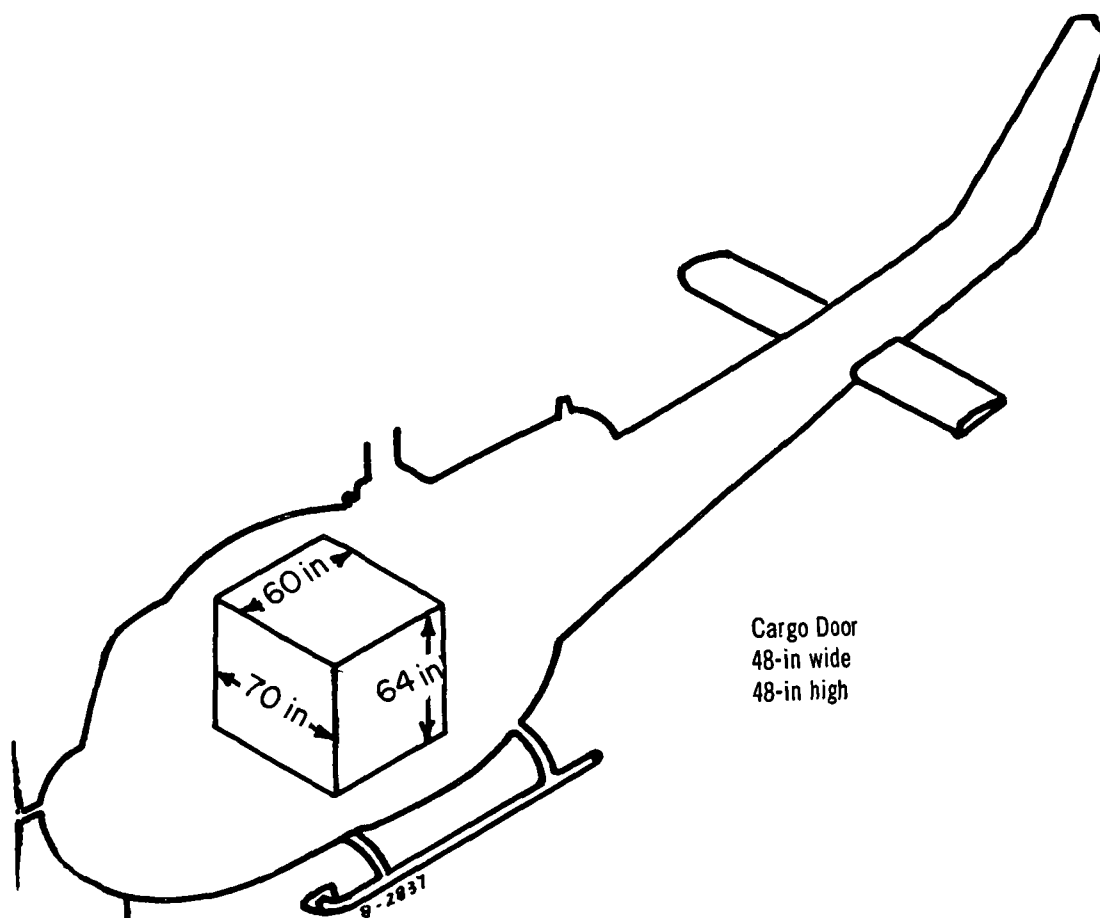


Figure 6-3. Iroquois (UH-1A).

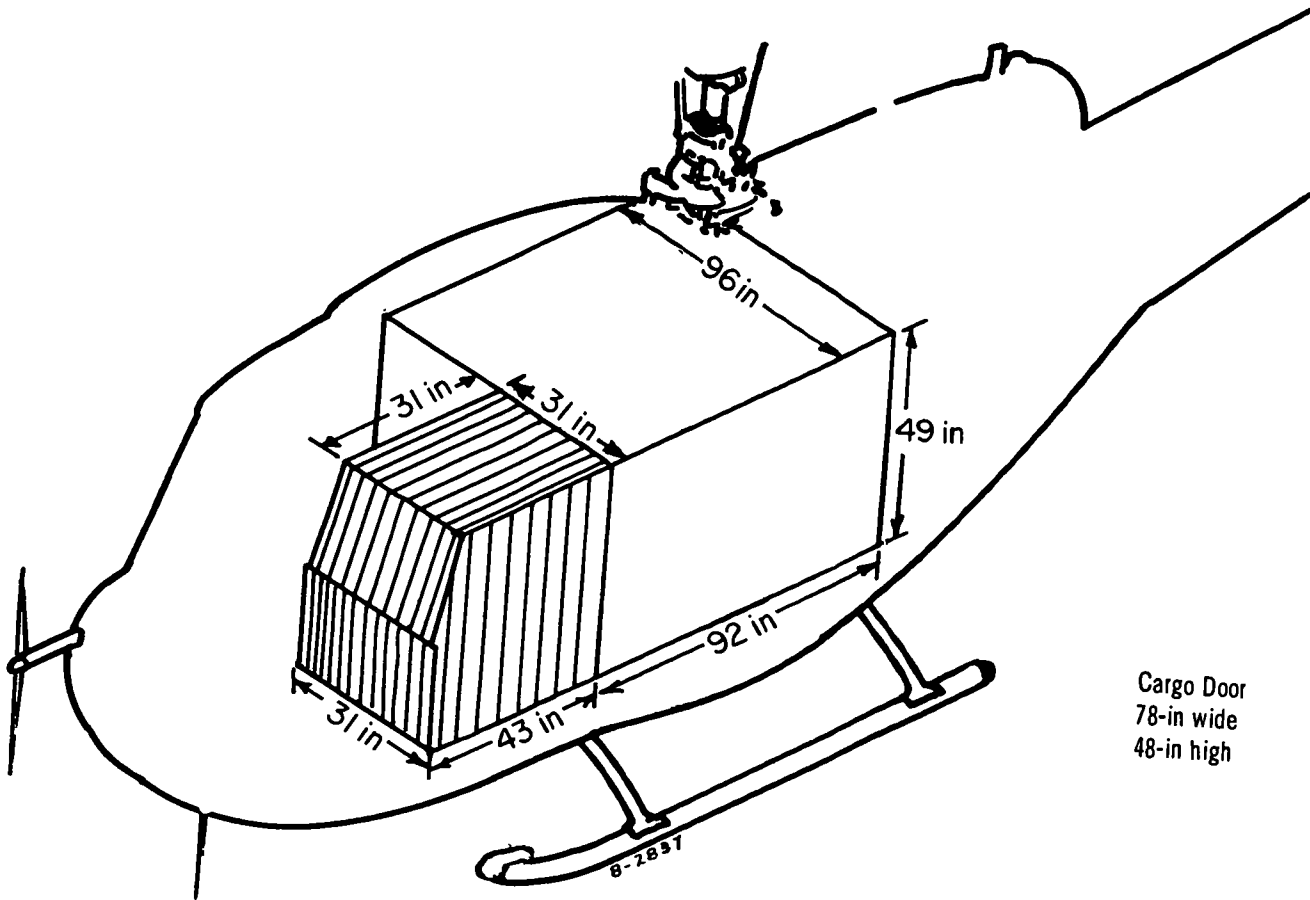


Figure 6-4. Iroquois (UH-1D).

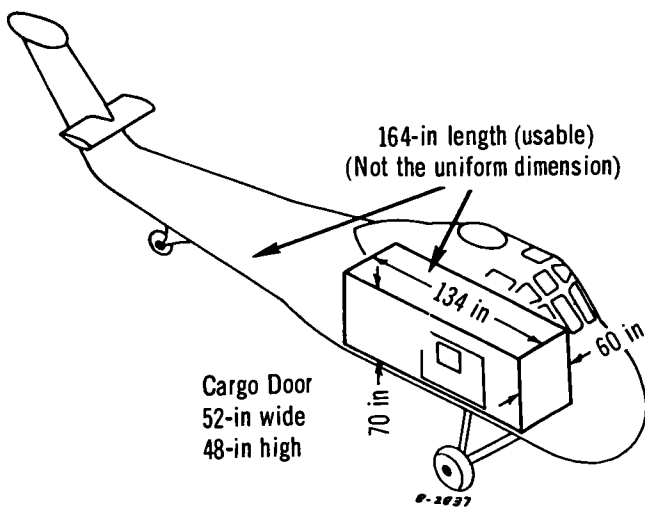


Figure 6-5. Choctaw (CH-34A).

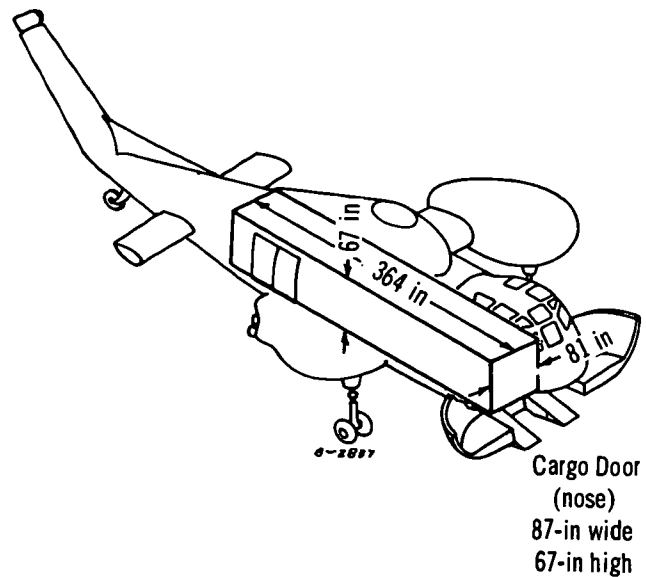


Figure 6-6. Mojave (CH-37A).

(d) *Maintenance.* Maintenance facilities should be provided at primary landing sites, the minimum requirement being a sheltered area that provides adequate cover for organizational maintenance on the helicopters. For planning, 7 organizational maintenance man-hours per flying hour may be considered average for the UH-19, 10.8 hours for the CH-21 and CH-34, 15.6 hours for the CH-37 and CH-47, and 6 hours for the UH-1A, -B, -D aircraft.

(e) *Hours of operation.* The average number of hours of operation per day for extended periods should not exceed the daily equivalents of the annual flying hours' program contained in SB 1-1 for the type of helicopter employed.

(f) *Loading and unloading time.* The factors given below are for planning purposes and presume that the aircraft has been properly prepared for the personnel or cargo it is to transport. The times do not include palletizing general cargo for internal loading or rigging slings on cargo for external transport.

Personnel:

Troops	3 minutes
Casualties	10 minutes
Cargo internal in fuselage:	
Single vehicles	5 minutes
Vehicles with trailers	15 minutes
Palletized cargo (by hand)	20 minutes
Cargo suspended beneath helicopter:	
Hookup time only	30 seconds

(g) *Determination of transport helicopter requirements.*

1. Most helicopter operations will be of the short-haul type and may require that more than one-round trip (sortie) be flown in support of the movement.

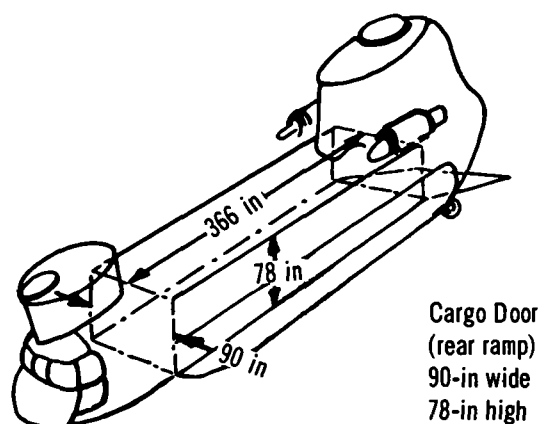


Figure 6-7. Chinook (CH-47A).

2. To determine the number of helicopters or units required to accomplish a given mission or the capabilities of helicopters on a specific mission, the staff planner should use the following formulas:

$$N = \frac{HS}{D} \text{ When—}$$

N = number of round trips (sorties per aircraft per day). This figure must be the resultant next lower whole number if a fraction is involved; a sortie must complete a round trip.¹

S = average sortie speed of aircraft in knots. For planning, use cruising speed unless some other speed is specified.

D = round-trip distance in nautical miles. This distance must be the actual distance flown rather than the airline distance from origin to destination. If the airline distance is used, add 15 percent to obtain estimated flight distance.

H = number of operational hours available

$$O = \frac{T}{N \times P}, \text{ when—}$$

O = number of operational aircraft required or available daily

T = tonnage to be moved or tonnage that can be moved

P = payload of type of aircraft used

$$A = 1.5 \times O, \text{ when—}$$

A = number of aircraft required or available to carry out a sustained operation. (This formula applies the daily availability factor or 67 percent to O to obtain A or to A to obtain O .)

3. This method of determining helicopter requirements is particularly applicable to movement of supplies or troops when combat loading is not a consideration. The planner should use a planning worksheet to determine aircraft requirements for air-landed assault operations. He uses the planning worksheet to develop loads that provide for tactical integrity of the combat units and combat loading of each aircraft. The planner can use the method of determining aircraft requirements described herein to estimate requirements for assault operations by adding 10 percent to the unit personnel and equipment tonnage to allow for combat loading.

4. *Examples:*

(a) A division has been allocated 18 CH-34 helicopters for 3 days to assist in moving supplies from field army supply points to division distribution points. The round-trip actual flight distance is 80 nautical miles. The division G4

¹ If service and fuel are available at both pickup and delivery points, one-half sortie can be computed as a lift. (A lift is the movement of a load from origin to destination.) This would require that the helicopters remain in the delivery point area for service, which normally is undesirable.

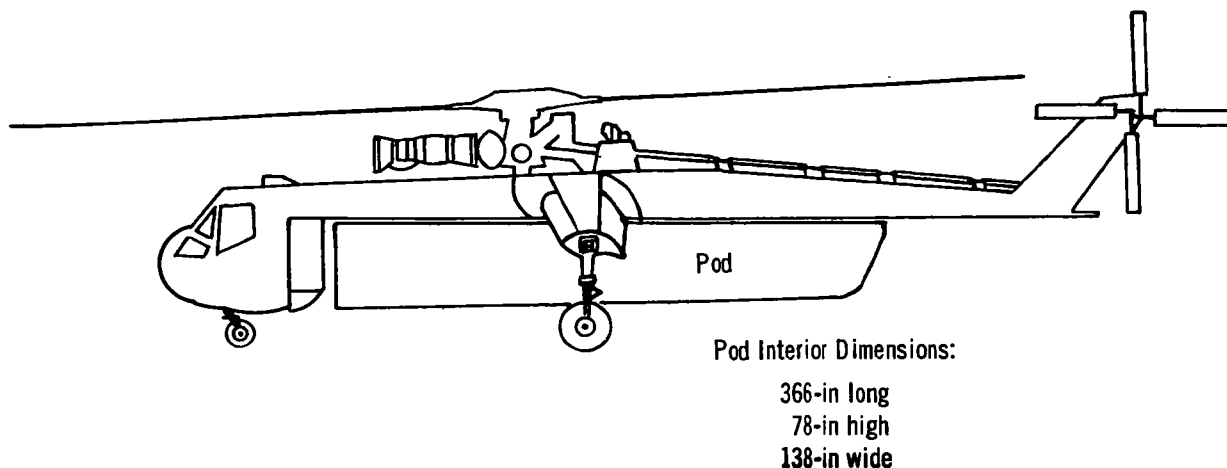


Figure 6-8. Flying Crane (CH-54).

desires to know what the daily lift capacity of this helicopter company will be for this mission.

Solve first for N (number of sorties per aircraft per day):

$$N = \frac{HS}{D}, N = \frac{4 \times 104}{80}$$

$N = 5.2$ or 5 sorties per day

Solve next for O (number of operational aircraft available):

$O = 67$ percent of A (18)

$O = 12$ operational aircraft per day

Solve for T (daily tonnage capability of available aircraft):

$$O = \frac{T}{N \times P}, 12 = \frac{T}{5 \times 1.89}, T = 113.4 \text{ STON per day}$$

(b) The field army G4 has a requirement to move 300 STON of cargo per day for 8 days from the field army service area to the 20th Infantry Division. Terrain and enemy action prohibit this movement by surface means. The G4 is computing the number of CH-34 and/or helicopter companies that will be required to accomplish this mission. The estimated flight distance from the 20th Infantry Division's distribution points is 28 nautical miles.

$P = 1.89$ STON

$T = 300$ STON

$S = 104$ knots

$D = 56$ nautical miles (round-trip distance)

$$N = \frac{4 \times 104}{56}, N = 7.4 \text{ or } 7 \text{ (sorties per aircraft)}$$

$$O = \frac{300}{7 \times 1.89}, O = 22.6 \text{ or } 23 \text{ (helicopters)}$$

$A = 1.5 \times 23, A = 35$ helicopters or approximately 2 companies of CH-34 helicopters

c. Fixed-Wing Aircraft.

(1) *General.* Army fixed-wing aircraft are limited in speed and range in comparison with larger transport-type aircraft. The capability of Army fixed-wing aircraft to land and take off from selected small, unprepared areas permits the

delivery of personnel and materiel to and the evacuation from areas of operations inaccessible to larger aircraft. The capability of Army fixed-wing aircraft to fly slowly and maintain a high degree of maneuverability further enhances their value in forward areas under combat conditions.

(2) *Planning factors (fixed-wing).* (See FM 101-10-3.)

(a) *Availability.* The operation plan should be based on the availability or 75 percent of the assigned aircraft for sustained operations. A higher availability ratio of 95 percent may be obtained for operations of short duration (less than 6 days). This higher availability ratio will depend on the status of maintenance and inspections, repair parts, time available for maintenance, and degree of skill of maintenance personnel.

(b) *Cargo.* Cargo may be delivered by three means: free fall, parachute, or air landing. The receiving unit normally requests the type of delivery to be used. The size and amount of cargo that may be loaded internally are governed by (fig. 6-9 and 6-10) —

1. Size of compartment door.
2. Compartment door location with respect to the cargo compartment.
3. Size of cargo compartment.
4. Lift capability of the aircraft used.

(c) *Landing facilities.* The development of a landing area adequate for prolonged operations or for accommodation of frequent traffic is a continuous operation. The planner must provide for an adequate landing area when planning aircraft movements. The minimum requirements for landing areas are indicated in table 6-37.

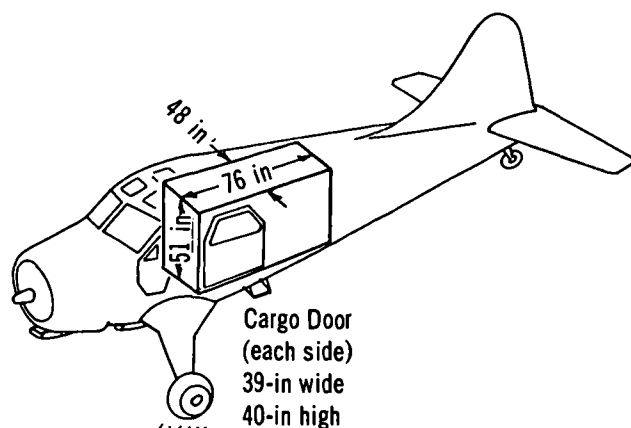


Figure 6-9. Beaver (U-6A).

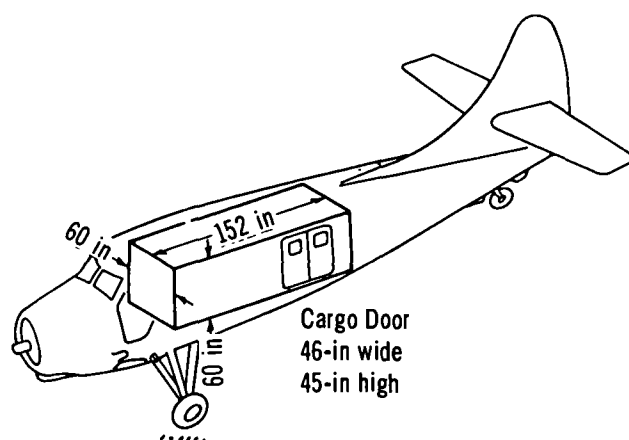


Figure 6-10. Otter (U-1A).

Table 6-37. Minimum Landing Area Requirements

1		2		3
1	Aircraft at maximum gross weight	No wind conditions at sea level over 15-m obstacle		
		Length (m)	Width (m)	
2	O-1A.....	250	15	
3	U-6A.....	370	20	
4	U-8D.....	760	20	
5	U-1A.....	460	20	
6	OV-1A.....	900	20	
7	U-9C.....	650	20	
8	U-10A.....	200	15	
9	U-21A.....	260	20	
10	T-41B.....	200	20	
11	T-42A.....	490	20	

(d) *Maintenance.* Under normal climatic conditions, no extensive facilities are required for organizational maintenance. Special equipment and facilities are required for operation in extreme climatic conditions. Direct support field maintenance units are equipped for field operations under normal climatic conditions. Special considerations for equipment and facilities are

required under extreme conditions. For man-hour requirements for aircraft maintenance, the planner should consult applicable publications.

(e) *Hours of operation.* Based on a sustained operation, average flying hours per airplane should not exceed the daily equivalents of the annual flying hours' program contained in SB 1-1.

(f) *Loading time.*

Personnel:

Troops — 2 to 3 minutes (depending on type of aircraft).

Casualties — 10 minutes.

Cargo:

Internal in fuselage (depending on type of cargo) — 10 to 30 minutes.

External beneath wings of airplane — 10 minutes.

(g) *Unloading time:*

Personnel:

Troops — 1 minute.

Casualties — 10 minutes.

Cargo:

Internal in fuselage — 5 minutes.

External (air-landed) — 10 minutes.

Parachute — 30 seconds.

Free fall — 10 seconds.

6-45. Air Force Transport Aircraft

a. FM 61-100, 100-5, 101-5, and 101-10-3 provide general considerations and procedures governing the employment of Air Force transport aircraft in joint operations.

b. In planning for joint airborne operations, the commander and staff officer should be familiar with the following basic terms:

(1) *Allowable cargo load (air)*—The weight of cargo in pounds that can be loaded into an aircraft for a specific mission. In an airborne operation, the Air Force commander announces the allowable cargo load (ACL) for each type of aircraft. The ACL of an aircraft varies with distance and certain other conditions. The greater the distance, the greater the weight of fuel and resultant reduced ACL. In radius operations, the ACL for the distance traveled for parachute operations may be greater than that for air-landed operations because of a necessary safety restriction of the total weight of the aircraft on landing. The ACL for an aircraft can be determined for any range or radius by referring to graphs provided for that purpose.

(2) *Radius of action*—The maximum distance to which an airplane can safely travel and return without refueling. Operations under radius conditions are those in which aircraft deliver

troops or materiel at a destination and return without refueling.

(3) Range — The distance from the takeoff point to the point where an airplane delivers its cargo load (safety margin of reserve fuel included). Refueling is required to return to the original takeoff point.

c. TM 55-450-15 contains a general description of the various types of military aircraft and their technical characteristics and performance data, to include cargo-distance graphs; cargo compartment dimensions; troop transport, litter transport, parachutist, and air-delivery provisions.

d. Paragraph 6-3 contains planning data for determining Air Force transport aircraft require-

ments for movement of units of a typical field army.

e. Table 6-38 is included for use as a guide to commanders and staff officers in computing typical load requirements for airlifting Army aircraft in Air Force transport aircraft. Total requirements of Air Force transport aircraft necessary to lift complete table of organization and equipment (TOE) units may be determined by combining aircraft requirements based on the data in the table with the tabulated requirements for the aviation unit concerned in paragraph 6-41. Space rather than weight is the critical factor in transporting aircraft only. The weight figures shown in the table include an estimated 240 pounds per ton of aircraft for crating and cradling materiel.

Table 6-38. U.S. Air Force Transport Aircraft Characteristics

1	2	3	4	5	6	7	8	9
	C-5A * (Galaxy)	C-7A (Caribou)	C-123 (Provider)	C-124 (Globemaster)	C-130 (Hercules)	C-133B (Cargomaster)	C-135 (Stratolifter)	C-141 (Starlifter)
2 Emergency max cargo payload ^b	265,000	7,500	12,000	59,000	49,000	106,000	77,500	64,405
3 Normal max cargo payload ^b	230,000	7,500	12,000	47,000	37,000	86,000	77,500	64,405
4 Emergency max troop capacity	345	32	61	200	92	120 °	126	154
5 Normal max troop capacity (over water/over land)	345	32	61	200	92	120	75/126	154
6 Litter capacity (no attendants)		20	50	127	74	55 °	44	80
7 Paratroops		26		112	64			123
8 Average cruise speed (knots)	440	150	138	200	275	270	467	440
9 Max range (nautical mile)	5,500	975	1,200	3,620	3,540	3,565	6,640	4,800
Cargo doors:								
10 Dimensions-width/height (in)	228.0×162.0	73.5×74.0	110.0×98.0	136.0×139.0	123.0×108.0	132.5×159.0	117.0×78.0	123.0×108.0
and location	fwd	rear	rear	fwd	rear	rear	fwd left	rear
	228.0×114.0 °			93.0×159.0		106.0×100.0	117.0-136.0	
	rear			elevator well		fwd left	rear	
Cargo compartment:								
11 Floor level to ground (in)	73.0	45.6	33.5	105.0	40.0	50.0	121.0	50.0
12 Length usable (in)	1,453.0	345	420.0	884.0	492.0 ^d	982.0 ^d	860.0	840.0
13 Width floor (in)	228.0	81	110.0	133.0	123.0	142.0	117.0	123.0
14 Height clear (in)	162.0	75	98.0	139.5	109.0	143.0	85.0	109.0
15 Cubic space (cu ft)	34,734	1,213	2,420	3,876	2,818	11,482	4,950	5,400
Typical logistic mission								
16 Payload/nautical miles	220,000/3,050	7,000/400	12,000/990	42,000/1,500	37,000/2,900	63,400/2,500	61,120/2,300	57,462/4,000
	112,600/5,500							

* Detailed characteristics are taken from current manufacturers' specifications. Data are subject to change, resulting from developmental testing.

^b Maximum allowable cabin loads (ACL) (lb) will vary with operating weight of aircraft (para 6-41). Aircraft gross takeoff weight that includes fuel, oil, water, flight personnel, and the logistic range mission determines the maximum allowable payload for either normal or emergency operations.

° Emergency only.

^d Excludes ramp.

° With the ramp lowered to ground, rear cargo opening will accommodate vehicles or other loads up to 150.0 in (12.5 ft) in height.

Section VI. MISCELLANEOUS TRANSPORT

6-46. General

Other means of transportation are relatively less important than pipeline, water, rail, highway, and air transportation in the overall picture of transportation. However, all these other means have peculiar characteristics that are adaptable to special situations, as indicated in paragraph 6-47 through 6-49. Therefore, planners should not underestimate their value.

6-47. Pack Animals

a. Employment. Pack mules may be employed to transport light cargo over terrain that is impassable for motor transport.

b. Characteristics and Capabilities. Characteristics and capabilities of pack animals are as follows:

- (1) Height — 59 to 62 inches.
 - (2) Weight — 1,000 to 1,200 pounds.
 - (3) Rate of march — 2.5 kilometers per hour average.
 - (4) Cargo load — 200 to 250 pounds.
 - (5) Movement of casualties — one litter or two sitting casualties.
 - (6) Forage — 10 pounds of oats and 14 pounds of hay per day. May be reduced for short periods up to 10 days without impairing capability.
 - (7) Water — 10 gallons per day.
 - (8) Average daily distance.
 - (a) Mountainous terrain — 19 kilometers.
 - (b) Rolling or flat terrain — 35 kilometers.
 - (9) Gradability.
 - (a) Rate of ascent — 500 vertical meters per hour.
 - (b) Rate of descent — 300 vertical meters per hour.
 - (10) Noneffective rate — 32 per 1,000 mules.
- c. Transportability.* Table 6-39 provides transportability data for pack animals.

Table 6-39. Transportability of Pack Animals

1	2	
	Vehicle	Capacity (horses or mules)
2	Truck, 1 ½-ton, cargo.....	2
3	Truck, 2 ½-ton, cargo, 6x6.....	4
4	Semitrailer, 6-ton, combination animal and cargo.....	8
5	Railroad stock car, 40-ft.....	25 (approx)
6	Railroad stock car, 36-ft.....	20 to 22 (approx)
7	Airplane, transport*.....	4 to 6

*May be transported at altitudes up to 18,000 feet with no ill effects.

d. Horse-Drawn Carts. Horse-drawn carts can travel 32 kilometers in the day and can sustain a payload of 1,000 pounds.

6-48. Sled Trains

a. General. A sled train furnishes oversnow and overice movement of supplies, equipment, and personnel. Sled trains are employed when more efficient means of transportation are not feasible.

b. Planning Factors.(1) *Capacity of cargo transporters.*

(a) Sled, 10-ton (OTACO) — bed dimensions, 8 feet by 20 feet; capacity, 20,000 pounds.

(b) Sled, 20-ton (OTAGO) — bed dimensions, 12 feet by 24 feet; capacity, 40,000 pounds.

(c) Transporter, cargo, large-wheel, off-road (Thompson trailer) — main cargo bed dimensions (with side extensions), 12 feet by 13 feet; rear-axle cargo well, two usable cargo areas, each 4 feet by 4 feet, separated by rear axle; capacity, 20,000 pounds.

(2) *Capability of tractor prime movers.*

Recommended loads for a heavy crawler tractor are listed in table 6-40. Experience shows that loads heavier than these result in greatly increased equipment failure and frequent inability of the tractor to move the load under soft snow conditions.

Table 6-40. Capability of Tractor Prime Movers

1	2	
	Class	Net weight (lb)
2	Tractor, full-tracked, diesel-engine driven, heavy drawbar pull, low ground pressure (LGP), Caterpillar D8, with D-342 engine.....	72,000
3	Same as above, but with D-353 engine.....	72,000

Note. Not used when traveling over unprepared trails or cross-country.

(3) *Payload capacity.* Assuming that marked trails will be used, weather delays will be encountered, and malfunctioning equipment will be dropped for later recovery, the payload capacity of five tractor sled trains (D8 LGP with D-342 engine as prime mover), consisting of one command train (one tractor pulling four wanigans) and four cargo trains (four tractors each pulling four loaded 10-ton sleds or 10-ton trailers or two loaded 20-ton sleds), on 161- and 322-kilometer destination trips is as determined in table 6-41.

(4) *Rates of speed.* Performance figures in table 6-42 pertain to the D8 (Caterpillar) LGP tractors used in Greenland by the U.S. Army Polar Research and Development Center and in Antarctica by the U.S. Navy Antarctic Support Force. The tractors are equipped with either the D-342 or the D-353 turbocharged engine.

Table 6-41. Payload Capacity of Tractor Sled Trains

1	Factors	2	3
		322-km round trip	644-km round trip
2	Fuel per tractor—2.22 gallons per km × km (round trip).....	715 gal.....	1,430 gal
3	Gal per tractor × 5 tractors.....	3,575 gal.....	7,150 gal
4	Plus 15-percent safety margin.....	536 gal.....	1,072 gal
5	Total gal.....	4,111 gal.....	8,222 gal
6	Total gal × 7.75 lb per gal (bulk diesel at 10° F.).....	31,860 lb.....	63,720 lb
7	Lubricants, alcohol, and antifreeze—30 lb per tractor per 161-km.....	300 lb.....	600 lb
8	Travel time at 80.5 km per day.....	4 days.....	8 days
9	Fuel for snow melters, heaters, and electric generators in command train— 180 gal per day × 7.75 lb per gal.....	5,580 lb.....	11,160 lb
10	Total domestic load (line 6 + line 7 + line 9).....	37,740 lb, or 18.87 STON	75,480 lb, or 37.74 STON
11	Gross capacity: 4 cargo trains × 40 STON per train.....	160 STON.....	160 STON
12	Payload capacity (line 11 —line 10).....	141.13 STON.....	122.26 STON

Note. Rations, tools, repair parts, and survival equipment are carried in or on the wanigana of the command train. This permits the sleds or trailers of the cargo trains to be used fully as cargo carriers.

Table 6-42. Vehicle Speed of Tractors

1	Gear	2		3		4		5	
		D-342		D-353		D-353		D-353	
		Speed (kmph)		Speed (kmph)		Speed (kmph)		Speed (kmph)	
		Forward	Reverse	Forward	Reverse	Forward	Reverse	Forward	Reverse
2	1st.....	2.41	3.21	3.25	3.25				
3	2d.....	3.05	4.18	4.61	4.61				
4	3d.....	4.50	6.11	5.63	11.97				
5	4th.....	6.11	-----	8.65	-----				
6	5th.....	8.36	-----	11.97	-----				

6-49. Human Bearers

a. *General.* Human bearers consist of indigenous or other personnel used for the transportation of personnel and/or supplies. Their use is generally limited to those situations where other means are impracticable or not available.

b. *Planning Data.* For planning, the following factors may be assumed:

(1) Cargo loads.

(a) Male bearer — 80 pounds' average load.

(b) Female bearer — 30 to 35 pounds' average load.

(2) Personnel loads — 8 to 12 bearers per litter team (for continuous operation).

(3) Rate of march — 19 kilometers in the day under average conditions and level terrain.

(4) Overloading and speedup of operations cause desertions and increase the sick rate.

(5) Noneffective rate — 30 percent.

(6) Close supervision required to prevent pilferage.



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CHAPTER 7

COMBAT SERVICE SUPPORT—MAINTENANCE

Section I. MAINTENANCE

7-1. Maintenance Service in the Theater of Operations

Maintenance of ammunition is covered in paragraphs 5-8 through 5-17.

a. General. Maintenance support is predicated on the concept of service to user to assist him in keeping his equipment in a serviceable condition and to repair and return unserviceable equipment as soon as practicable. This is accomplished, at the direct support level, by providing supported units with technical assistance, contact team support, by the repair of equipment for prompt return to supported units, and by using direct exchange and operational readiness float procedures. At the direct support maintenance level, repair of end items is expedited by concentrating on the replacement of defective components, and the end items so repaired are returned to the supported units. GS maintenance units will repair and return the repaired components to supply channels.

b. Procedures. All maintenance DS and GS units will initiate requests for repair parts directly on the support brigade stock control center (SCC). The supporting GS repair parts supply company will supply repair parts directly to the supported DS or GS unit. Each maintenance unit of the DS maintenance battalion except the DS aircraft maintenance company will maintain an operational readiness float of combat critical end items of equipment. End items beyond the repair capabilities at the DS level for any reason will be turned in to DS maintenance unit by the using unit and a replacement requisitioned by the using unit supply channels. Equipment beyond the repair capability or repair time limits of the DS light maintenance companies will be evacuated to the DS battalion's main support company. Equipment beyond the repair capability of the main support company will be reported to the MMC, support brigade, and evacuated to designated GS units as directed.

c. DS.

(1) DS elements of the DS maintenance battalions (TOE 29-136 for HHD) serve as source of supply for repair parts. The DS maintenance battalion, or elements thereof, may be used to replace the type of elements within a divisional maintenance battalion.

(2) The maintenance company, rear, DS

(TOE 29-208), provides DS backup maintenance to the light maintenance companies of the battalion and DS to users for heavy equipment. The light maintenance company, DS (TOE 29-207), provides DS maintenance, limited evacuation and maintenance, and supply support for nondivisional units in the field army area. The mission does not include support of cryptographic, air-delivery equipment, or equipment maintained by the medical depot and ammunition groups of the FASCOM.

(3) The transportation aircraft DS company (TOE 55-457) provides DS maintenance, maintenance supply support, and field army recovery service for aircraft, avionics, and air weapons, organic to nondivisional units in the field army. Capabilities at three strength levels follow (man-hours per month) :

	<i>Level 1</i>	<i>Level 2</i>	<i>Level 3</i>
Aircraft.....	21,600	19,400	17,400
Avionics.....	3,600	3,240	2,800
Armament.....	800	600	600

d. GS.

(1) GS maintenance battalions (TOE 29-136 for HHD) provide GS maintenance service and backup maintenance support to combat divisions and nondivisional DS units.

(2) Light equipment GS maintenance company (TOE 29-134) provides GS maintenance for light end items and components thereof.

(3) Heavy equipment GS maintenance company (TOE 29-137) provides GS maintenance for components of wheeled and tracked vehicles, artillery, heavy construction equipment, or vehicle-mounted chemical equipment and end items in these categories, when required. In addition, the unit provides GS maintenance for small arms, instruments, and fire control equipment. It also performs GS maintenance on reserve stocks of end items supported.

(4) Transportation aircraft maintenance GS Company (TOE 55-458) provides GS maintenance for aircraft and aircraft armament and backup DS maintenance for aircraft, avionics, and aircraft armament for divisional and nondivisional DS aircraft maintenance companies in the field army. It can provide approximately 33,000 man-hours per month of GS and backup DS maintenance including armament GS and armament and avionic backup DS.

(5) Collection and classification company (TOE 29-139) establishes and operates a collection and classification point for the receipt, inspection, segregation, disassembly, preservation, and disposition of serviceable and unserviceable class II, VII, and IX materiel. Materiel to be scrapped is turned over to the supply and service battalion for disposition as scrap, sale, donation, or destruction. The company will not handle items of cryptographic materiel, missile systems, and medical materiel.

e. Field Army.

(1) Units providing maintenance and repair parts support of army materiel in the field army area are shown in table 7-1. Both divisional and nondivisional units are included. Each unit is identified to indicate whether its mission is DS or GS.

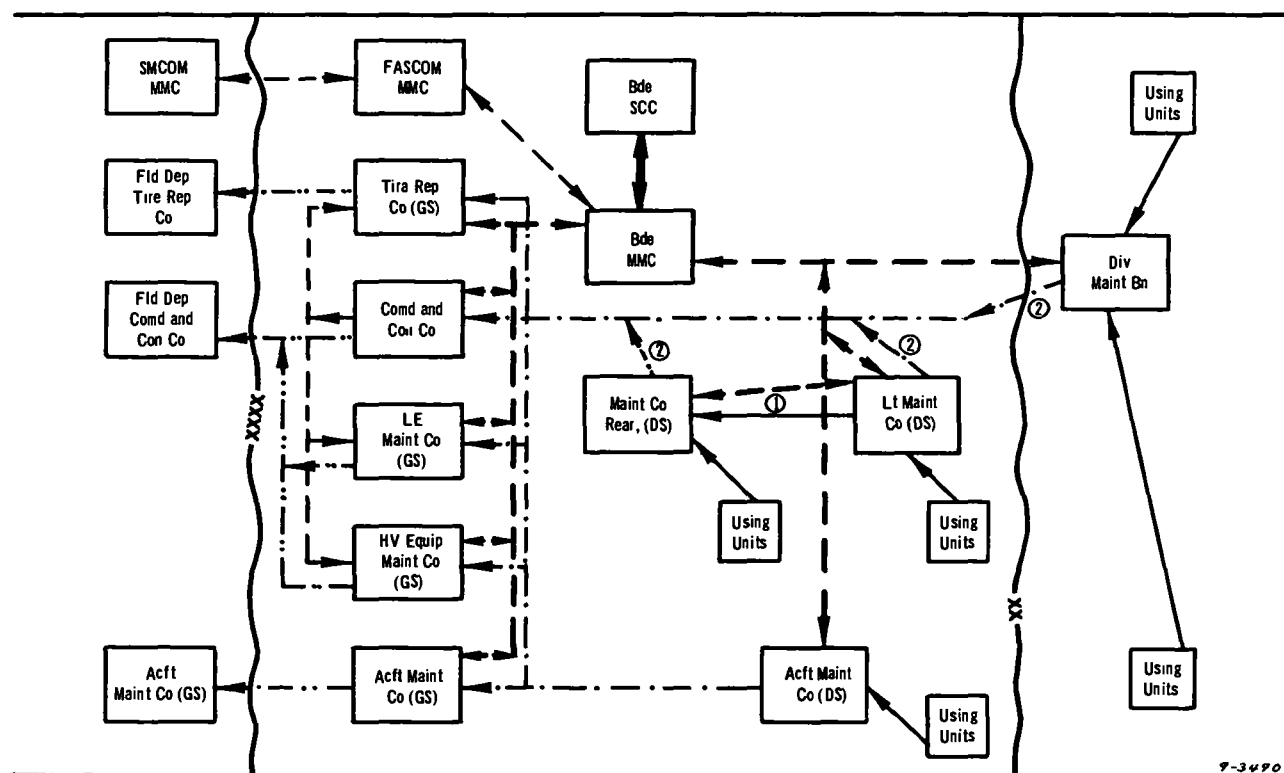
(2) End items of equipment are indicated across the top of the table. Units providing support are indicated on the left side of the table together with their support role (DS or GS). To determine which unit provides support for a specific commodity of materiel, read across the top of the table to the column indicating the commodity of interest and down the column until the appropriate entry is found. Then, by looking to the left side of the table on the same line corresponding to the entry, determine the unit involved in providing support. Abbreviations used in columns 3 through 19 follow:

DS — direct support mission.

DS — direct exchange.

GS — general support mission.

MR — complete support, including inspection, repair, and repair parts support.



LEGEND

- ↔ Coordination between MMC and SCC relative to disposition of repaired items and excesses, scrap, and priorities for processing certain types of materiel.
- Evacuation from using units to DS maint units.
- - - - - Evacuation of items beyond the repair capability or capacity of DS maint to GS maint or collection facilities. Evacuation destinations are provided by the MMC and are based on types of items being evacuated and workloads of GS maint units.
- ↔ Flow of information and instructions relative to types of items requiring evacuation to a higher support category, condition of materiel, and disposition instructions
- ... Overflow GS and items requiring dep maint.
- - - - - Flow of reparable materiel from the comd and con co to maint units.

NOTES: This illustration depicts only the evacuation of unserviceable class II, VII, and IX materiel supported by DS and GS maint bns. It does not depict evacuation of scrap and other salvaga channel items, aircraft, ammunition and missile system items, medical materiel, crypto and foreign materiel which is evacuated as directed by technical intelligence agencies.

① Evacuation for backup DS maint.

② In general, items directed to the comd and con co consist of economically reparable end items (except aircraft, small arms, and instruments), requiring general or depot support maint, and those economically reparable end items containing serviceable or reparable components/parts which are to be reclaimed. The bulk of the items evacuated by DS maint units consists of unserviceable components which will normally be repaired at the appropriate GS maint unit. Small arms, instruments, items requiring GS level MWO application, and end items repaired at the GS levels for repair and return to user will also be evacuated directly to the appropriate GS maint unit.

Figure 7-1. Evacuation flow of unserviceable class II, VII, and IX items supported by DS/GS maintenance battalions.

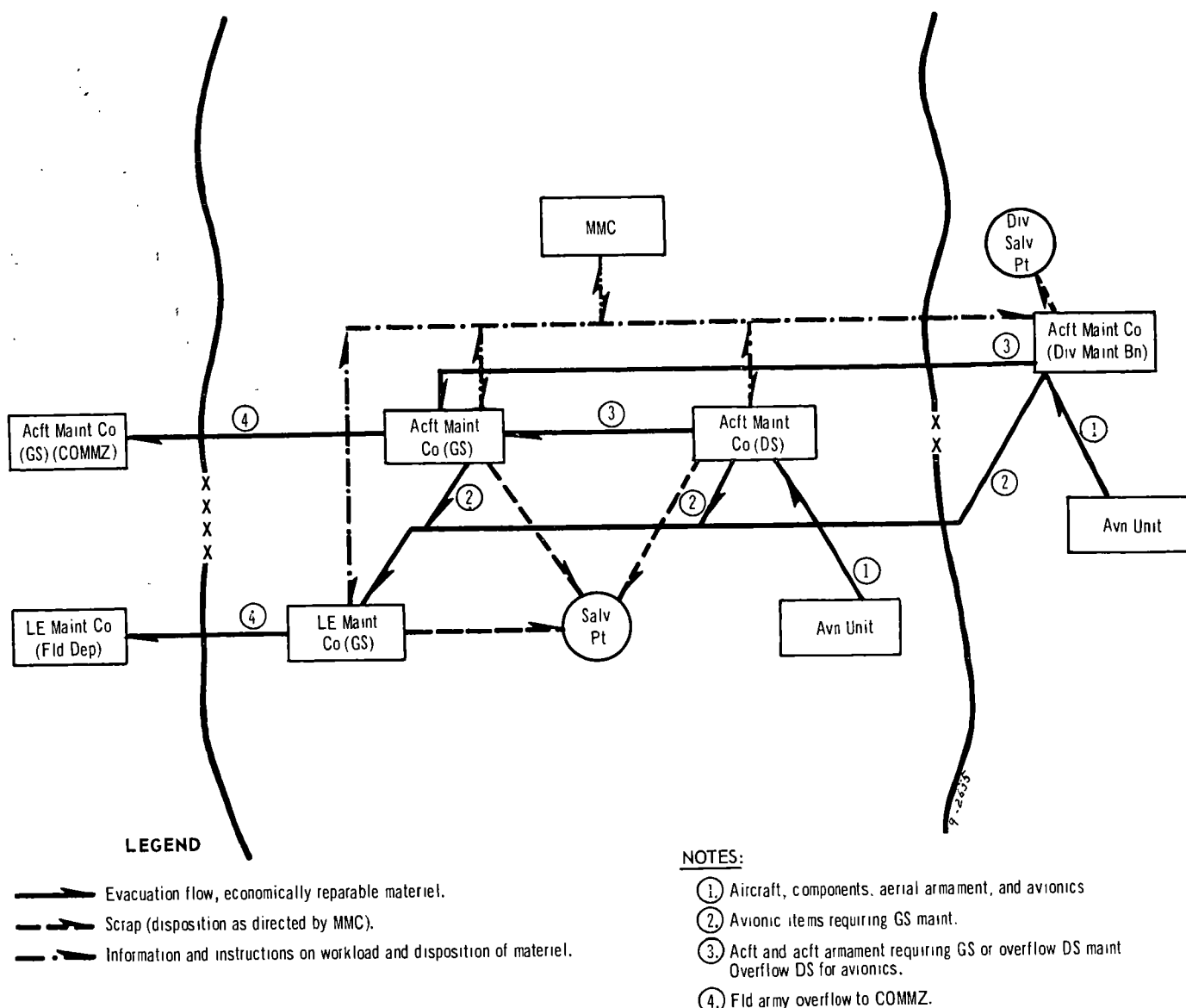


Figure 7-2. Field Army aircraft evacuation channels.

PO — repair parts only. No repair.

RO — repair only. No parts issued.

f. *Evacuation Flow.* Figures 7-1, 7-2, and 7-3 show evacuation flow of unserviceable items of equipment evaluation channels for aircraft, and repair parts flow responsibility.

7-2. Maintenance Control

a. *General.* This paragraph outlines a workload control system designed to determine whether an item can be repaired at the DS maintenance level or whether it must be evacuated. The system sets forth the means of computing and controlling the maintenance backlog and general policies applicable thereto. The workload control system is a managerial tool used to balance actual work-

load against the workload that a maintenance facility can assume. This system is intended as a guide only and is flexible in application. The system is based on the fact that a maintenance facility has a certain number of man-hours to expend on accomplishment of its mission during a given period of time and the workload should, in general, be limited to that capacity. This permits the programing of work to allow maximum concentration on a large number of small jobs, if required; a smaller number of large jobs, if desired; or any combination of both.

b. *Objectives.* The objectives of the workload control system follow:

(1) To establish a criterion or factor, in terms of man-hours, that can be used in determining whether an item can be repaired at the DS

Table 7-1. Maintenance Support Capability
a. Mobility Equipment and Supply and Service Items

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Unit	TOE	Support role	Automotive items and related components (less tires)	Tires and tubes	Aircraft and related components	Air delivery equipment	Construction equipment	Reproduction and survey equipment	Lighting and power-generating equipment	Refrigeration and air conditioning equipment	Materials-handling equipment	Clothing and light textiles	Laundry, bath, and baking equipment	Food service equipment	Fuel-dispensing and POL equipment	Burners, fire units, and heaters	Office machines	Sewing machines
<i>Nondivisional</i>																		
2 Tire rep co	9-117G	GS	---	RO	---	---	---	---	---	---	---	---	---	---	---	---	---	---
3 QM air dlvr co	10-407G	DS	---	---	---	DX	---	---	---	---	---	---	---	---	---	---	---	---
4 Fld svc GS co, fwd	29-114G	GS	---	---	---	---	---	---	---	---	---	DX	---	---	---	---	---	---
5 Rep parts GS co, fwd	29-119G	GS	PO	PO ¹	PO	---	PO	PO	PO	PO	PO	---	PO	PO	PO	PO	PO	PO
6 Rep parts GS co, army	29-119G	GS	PO	PO ¹	---	---	PO	PO	PO	PO	PO	---	PO	PO	PO	PO	PO	PO
7 Fld svc GS co, army	29-124G	GS	---	---	---	---	---	---	---	---	---	RO	---	---	---	---	---	---
8 LE GS maint co	29-134G	GS	---	---	---	---	---	RO	RO	RO	---	---	---	RO	---	RO	RO	RO
9 Hv equip GS maint co	29-137G	GS	RO	---	---	---	RO	---	---	---	RO	---	RO	---	RO	---	---	---
10 HQ and maint spt co, maint DS bn	29-206F	DS	MR	PO ¹	---	---	MR	MR	MR	MR	MR	---	MR	MR	MR	MR	MR	MR
11 Lt maint DS co	29-207G	DS	MR	PO ¹	---	---	MR	MR	MR	MR	MR	---	MR	MR	MR	MR	MR	MR
12 S&S co, S&S bn, DS	29-217G	DS	---	---	---	---	---	---	---	---	---	DX	---	---	---	---	---	---
13 Trans acft DS co	55-457G	DS	---	---	MR	---	---	---	---	---	---	---	---	---	---	---	---	---
14 Trans acft maint GS co	55-458G	GS	---	---	RO	---	---	---	---	---	---	---	---	---	---	---	---	---
<i>Divisional</i>																		
15 S&S co, S&T bn	10-7G	DS	---	---	---	---	---	---	---	---	---	DX	---	---	---	---	---	---
16 HQ and main spt co, maint bn, inf div	29-16G	DS	MR	PO ¹	---	---	MR	---	MR	MR	MR	---	MR	MR	MR	MR	MR	MR
17 Fwd spt co, maint bn, inf div	29-17G	DS	MR	PO ¹	---	---	MR	---	MR	MR	(2)	---	(2)	(2)	(2)	(2)	(2)	(2)
18 Trans acft maint co, maint bn, inf div	55-89G	DS	---	---	MR	---	---	---	---	---	---	---	---	---	---	---	---	---

¹ Replacement tires and tubes provided as repair parts.

² Maintains repair parts stockage as necessary for such items, if supported. Can perform limited maintenance of a mechanical nature. Most DS maintenance provided by HQ and main support company.

Table 7-1—Continued
b. Weapons and Electronics Items

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Unit	TOE	Support role	Artillery weapons (conventional and fire control systems)	Small arms	Nonintegrated fire control instruments	Conventional ammunition	Nuclear weapons and associated test equipment	Large missile systems	Small missile system, class II and VII components	Avionics	Aircraft armament	Communication equipment	Cryptographic equipment	Photographic and projection equipment	Electrical/electronic devices and equipment	Radiac equipment	Automatic data processing equipment	Electrical accounting machine equipment	Infrared devices	Smoke generators	Gas masks	Flamethrowers	Decontamination and protective equipment
<i>Nondivisional</i>																							
2	Ord ammo DS/GS co	9-17G	DS/GS	---	---	---	MR	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
3	Ord sp ammo DS co	9-47G	DS	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
4	Ord sp ammo GS co	9-48G	GS	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
5	Ord GM GS co	9-227E	GS	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6	HHC, spt gp	29-102G	DS/GS	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
7	Rep parts GS co, fwd	29-119G	GS	PO	PO	PO	---	---	PO	PO	PO	PO	---	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO
8	Rep parts GS co, army	29-119G	GS	PO	PO	PO	---	---	PO	PO	---	PO	---	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO
9	LE GS maint co	29-134G	GS	---	---	---	---	---	---	RO	---	RO	---	RO	RO	RO	RO	RO	RO	RO ¹	RO	RO ¹	RO ¹
10	Hv equip GS maint co	29-137G	GS	RO	RO	RO	---	---	RO	---	---	RO ²	---	---	---	---	---	---	---	RO ²	---	RO ²	RO ²
11	HQ and main spt co, maint DS bn	29-206F	DS	MR	MR	MR	---	---	---	---	---	MR	---	MR	MR	MR	---	---	MR	MR	MR	MR	MR
12	Lt maint DS co	29-207G	DS	MR	MR	MR	---	---	---	---	---	MR	---	MR	MR	MR	---	---	MR	MR	MR	MR	MR
13	Trans acft DS co	55-457G	DS	---	---	---	---	---	---	MR	MR	---	---	---	---	---	---	---	---	---	---	---	---
14	Trans acft maint GS co	55-458G	GS	---	---	---	---	---	---	RO ²	RO	---	---	---	---	---	---	---	---	---	---	---	---
<i>Divisional</i>																							
15	Sig bn (armd div, inf div, inf div (mech))	11-35G	DS	---	---	---	---	---	---	---	---	---	MR	---	---	---	---	---	---	---	---	---	---
16	HQ and main spt co, maint bn, inf div	29-16G	DS	MR	MR	MR	---	---	MR	---	---	MR	---	MR	MR	MR	---	---	MR	MR	MR	MR	MR
17	Fwd spt co, maint bn, inf div	29-17G	DS	MR	DX	MR	---	---	MR	---	---	MR	---	(³)	MR	MR	---	---	MR	(³)	(³)	(³)	(³)
18	Trans acft maint co, maint bn, inf div	55-89G	DS	---	---	---	---	---	---	MR	MR	---	---	---	---	---	---	---	---	---	---	---	---
19	Admin co	12-37G	DS	---	---	---	---	---	---	---	---	---	---	---	---	---	---	MR	---	---	---	---	---

¹ Except vehicular-mounted equipment.

² Limited repair to vehicular-mounted items only.

³ Maintain repair parts stockage as necessary for such items, if supported. Can perform limited maintenance of a mechanical nature. Most DS maintenance provided by HQ and main support company.

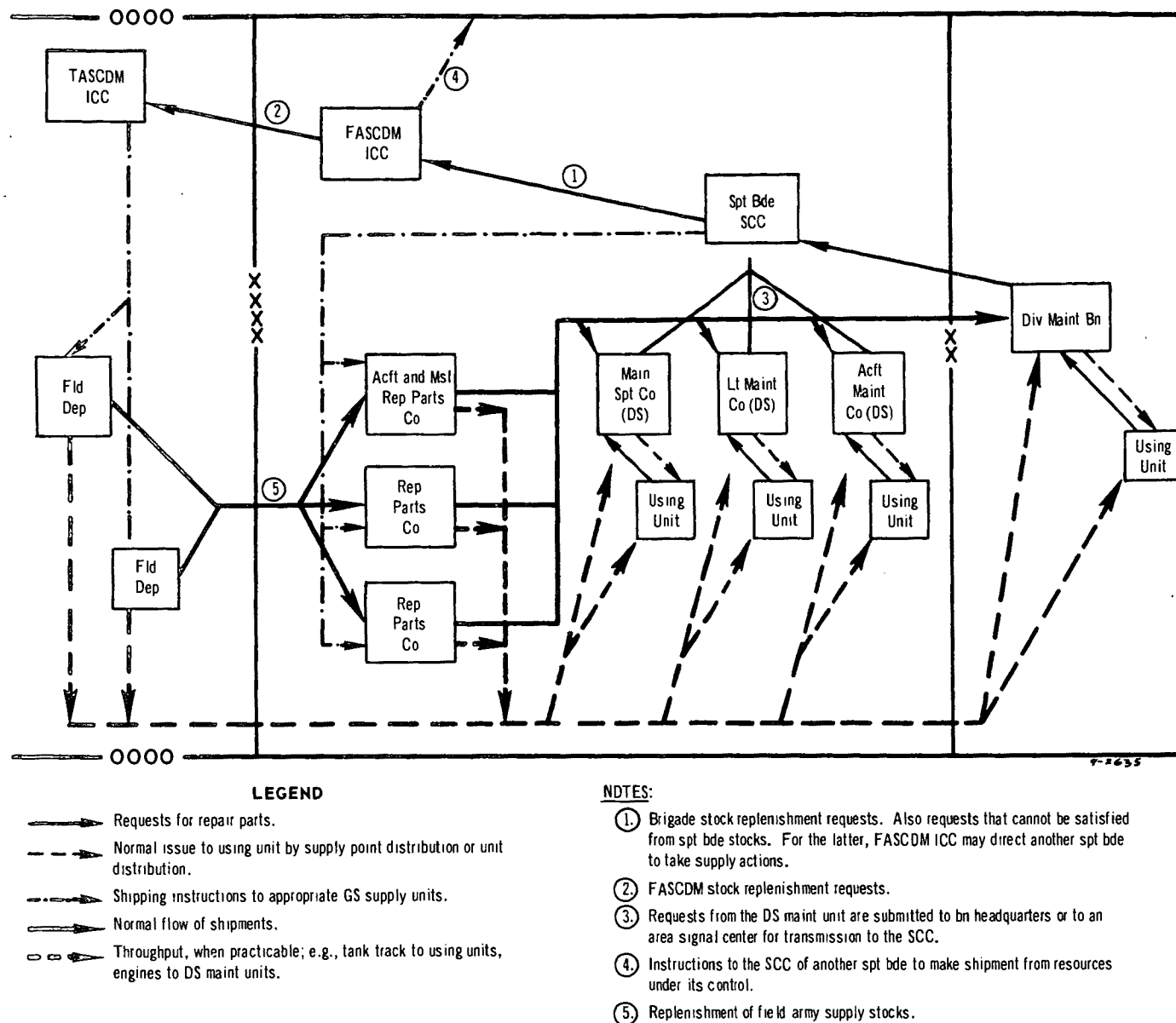


Figure 7-8. Repair parts flow in the field army (DS level) (less medical, missile, and cryptographic).

maintenance level or whether it must be evacuated.

(2) To establish, in terms of man-hours, the unit production potential.

c. *Value.* The fundamental principle of DS maintenance is to repair and return items of materiel to service as rapidly as possible. The capability of a unit to perform in this manner is limited by the type and quantity of tools, quality of personnel, and available production time. The value of the system is in its ability to relate these factors and determine the unit capacity.

d. *Factors.* The workload control system uses the following computations, which make up the basic factors on which it is based:

(1) *Man-hours.* The man-hour computation is made by deriving the total number of man-hours actually available from the total number of man-hours theoretically available. For example, a repair section has 11 productive item repair personnel assigned. Since it normally works 12 hours per day, there are theoretically 132 item repair man-hours available (12×11). Department of the Army policy and local conditions determine percentages that must be deducted from this total to arrive at the number of man-hours actually available. These percentages cover such nonproductive operations as movement time, administrative activities, maintenance of operating equipment, or other contingencies and

will vary, depending on the function or work activity involved. As a hypothetical example, an item repair section might actually have available 76.6 man-hours per day for the function of repair.

(2) *Workload.* Higher headquarters normally prescribed the workload, expressed in days, authorized to be on hand in the company (or section) at any one time. This usually represents the maximum number of days in which the company should complete the items scheduled for repair. When multiplied by the actual number of man-hours available each day, it represents the total number of actual man-hours available to the company (or section) for a given period of time. For example, if the prescribed workload is 3 days, the total number of actual item repair man-hours available to the section is 229.8 (3×76.6).

e. Utilization. Utilization of the workload control system in a repair section of a DS maintenance company is described below. The first example illustrates application when a standard repair time factor is available. The second illustrates application when the repair time factor has not been established.

(1) *Example 1.* The standard repair time factor for the repair of an item is 0.5 man-hour. The prescribed maximum workload for the section is 3 days (229.8 man-hours). Based on the standard repair time factor, the section can repair 459.6 items in the 3-day period. The section has on hand maintenance requests covering a total of 314 items. A new maintenance request (number 5) is received covering 50 items, or requiring 25 man-hours to complete the job.

(a) The workload control system is applied by subtracting the total number of items on hand from the total number that can be repaired in the prescribed 3-day limit ($459.6 - 314$). The resulting figure of 145.6 items indicates that maintenance request number 5 can be completed in the 3-day limit.

(b) If the calculation had indicated that maintenance request number 5 could not be completed in the 3-day limit, the company may have either evacuated the job to the next higher maintenance unit or assigned the job to the section with the understanding that additional jobs would have to be evacuated until the number of items on hand has been reduced.

(2) *Example 2.* A standard repair time factor has not been developed for the repair of a certain item. The prescribed maximum workload is 3 days (229.8 man-hours). The section has on hand 12 maintenance requests for the repair of items requiring an estimated 210 man-hours to

complete. A new maintenance request (number 13) requiring an estimated 25 man-hours to complete is received.

(a) The workload control system is applied, in this instance, by subtracting the total number of man-hours required to complete the jobs on hand from the total number of man-hours actually available ($229.8 - 210$). The resulting figure of 19.8 man-hours indicates that maintenance request number 13 cannot be completed in the 3-day limit.

(b) The company may, therefore, evacuate the job to the next higher maintenance unit or assign the job to the section with the understanding that no additional jobs can be accepted until the total number of man-hours of work has been reduced.

7-3. Operational Readiness Float and Direct Exchange Criteria

a. Operational Readiness Float.

(1) Operational readiness float comprises those end items or major components of mission essential, maintenance significant equipment authorized for stockage, normally by direct and general support maintenance units or activities to replace unserviceable equipment or meet operational requirements. Float items normally will be positioned at the supporting direct and general support maintenance units or activities. Operational readiness float will be provided for issue as replacement for unserviceable, economically repairable equipment to meet operational commitments, provided the equipment cannot be repaired in time to meet operational requirements. It will be provided also to oversee organization commanders and CONUS strategic and air defense organization commanders on a loan basis for items lost, destroyed or determined to be uneconomically repairable (AR 750-1). However, this procedure applies only when the supply delivery date is determined to be after the operational need date. When a float item is loaned under these conditions, the user is responsible for requisitioning a replacement item and returning the float item to the support unit. An operational readiness float will be provided in support of priority units before equipment is issued to lower priority units. Direct and general support maintenance units or activities will be authorized sufficient mechanics and transportation in the TOE or TDA to maintain and transport the operational readiness float in accordance with mission-prescribed mobility. Guidance for establishing operational readiness floats is contained in appropriate Department of the Army supply bulletins.

Table 7-2. Operational Readiness Float Authorizations

1	2	3
Line item number	Item or type of equipment	Operational readiness float (percentage)
2 B83582.....	Boat, brg erection, inboard eng, aluminum, 27-ft, gas-driven.....	10
3 F43414.....	Crane-shovel, trk-mtd, 20-ton.....	10
4 J36109.....	Genr set, diesel-driven, 30-kw.....	10
5 J38301.....	Genr set, diesel-driven, 60-kw.....	5
6 J50220.....	Genr set, ptbl, gas-driven, 10-kw.....	5
7 J74852.....	Grader, road, mtz, diesel-driven.....	10
8 L76488.....	Loader, scoop-type, diesel-driven, 4-wheel, 2 1/2-yd.....	5
9 N34334.....	Outboard motor, 25-BHP.....	5
10 S35741.....	Saw, chain, gas-driven, 18-in.....	10
11 W77090.....	Tractor, full-tracked, diesel-driven, hv DBP.....	15
12 W80515.....	Tractor, full tracked, diesel-driven, lt DBP.....	5
13 W80926.....	Tractor, full-tracked, diesel-driven, mdm DBP.....	15
14 W95400.....	Tlr, cargo, 1/4-ton.....	3
15 X40009.....	Trk, cargo, 2 1/2-ton.....	10
16 X62340.....	Trk, van, shop, 2 1/2-ton.....	3
17 D10990.....	Carrier, cargo, amph, tracked.....	4
18 D12086.....	Carrier, pers, full-tracked, armd.....	9
19 H55432.....	Fire con sys, AD.....	10
20 J96819.....	Gun, AD, SP, 40-mm.....	9
21 K56981.....	Howitzer, 8-in., SP.....	5
22 K57255.....	Howitzer, 105-mm, SP.....	6
23 K57392.....	Howitzer, lt, towed, 105-mm.....	3
24 K57666.....	Howitzer, 155-mm, SP.....	6
25 R50680.....	Tank recovery veh.....	8
26 V13269.....	Tank, cbt, 152-mm gun.....	9
27 W76679.....	Tractor, full-tracked, high-speed.....	8
28 Y33616.....	Watch, wrist.....	20
29 C19503.....	Breathing apparatus, compressed-air.....	10
30 C19640.....	Breathing apparatus, oxygen-generating.....	10
31 F82154.....	Decontaminating apparatus, power-driven, trk-mtd.....	10
32 G22109.....	Disperser, riot control agent, hel- or veh-mtd.....	15
33 G22246.....	Disperser, riot control agent, ptbl.....	15
34 H50418.....	Filter unit, gas-particulate, hospital, six-man, 12 cfm.....	5
35 H50829.....	Filter unit, gas-particulate, tank, three-man, 12 cfm.....	10
36 H68063.....	Flamethrower, ptbl.....	15
37 J30492.....	Genr, smoke, mech, pulse-jet.....	36
38 K26849.....	Heater, water, oil.....	10
39 M11210.....	Mask, CBR, dog.....	10
40 S79045.....	Service unit, flamethrower, trk-mtd.....	30
41 H49733.....	Filter unit, gas-particulate, elec, motor-driven or gas-driven, 300 cfm, ABC-M6.....	5

(2) Table 7-2 gives the operational readiness float authorizations recommended for selected types of equipment in DS maintenance units and activities. The factors are percentages of the total equipment supported by the maintenance activity and are subject to modification by the command concerned, depending on location, activity, and the supply station.

(3) Criteria for direct exchange replacement are expressed in the number of days an unserviceable item may remain in the maintenance facility without being repaired until it is exchanged and replaced by a like item from the operational readiness float stock of the maintenance facility. These criteria are established and modified as necessary by policy of the Department

of the Army and commands concerned, with recommendations and guidance from the technical services. For example, the following general policy is used for the establishment, stockage, and operation of direct exchange of repair parts and assemblies for major items of ordnance equipment:

(a) Items that have a high mortality rate and are repairable by cleaning, adjusting, or by use of repair kits may be placed on a direct exchange basis with using units.

(b) When a new operation is begun or a new item is added to the direct exchange list, 25 percent of the authorized unit stockage is used. This percentage factor may be increased or decreased as the activity or demands dictate. At no

time should an excess of 75 percent of unit stockage be placed in the direct exchange section.

(c) Direct exchange activities must be reviewed each 30 days to adjust the stockage. As demands decrease, the stockage should also decrease. Seasonal fluctuations in the demand for some items will affect direct exchange stockage, i.e., cause the direct exchange section to be overstocked or understocked. The 75- to 25-percent remaining stockage in the technical supply section is a buffer to replace items salvaged by the repair shop and deadlines caused by insufficient serviceable items in the direct exchange section.

(d) The data in table 7-2A should be used as a guide in exchanging operational readiness float items of equipment other than guided missiles and heavy rockets.

Table 7-2A. Equipment Downtime (Days)

1		2
1	Type of equipment	Downtime (days)
2	Combat vehicles	14
3	Transport vehicles	5
4	Fire control materiel	3
5	Automatic weapons, air defense and towed artillery	3
6	Small arms	(Immediate exchange on all items)

b. Direct Exchange.

(1) Direct exchange is a supply method of issuing through a direct exchange activity, serviceable material in exchange for unserviceable material on an immediate item-for-item basis. This is accomplished with a minimum of paperwork. The normal processing of property accountability documents between the direct exchange activity and the supported unit is not required.

(2) Items selected for direct exchange are determined by the joint and coordinated effort of maintenance and supply personnel. Placement in the direct exchange is not mandatory. Items selected for addition to, or retention in, direct exchange activities, however, must satisfy the following requirements:

(a) Be items that are reparable by the maintenance shop or local contractor supporting the direct exchange activity.

(b) Be items that require repair, or anticipated repair, at least 12 times per year for addition and six times per year for retention.

(c) Be mission-essential support items carried on the authorized stockage list providing the quantities stocked in the direct exchange activity, plus the quantities on hand in the direct support unit (DSU)/installation property ac-

count do not exceed the total requisitioning objective for such items.

(3) Unserviceable items received by the direct exchange activity will be turned over to the maintenance shop for repair. Items that are found to be nonreparable by a maintenance facility are returned to the supporting supply activity or property disposal officer by the direct exchange activity.

(4) Items to be handled in a direct exchange basis are issued to the direct exchange activity and dropped from the accountable records of the property account.

(5) Records to maintain balance on hand and to accumulate repair rate, resupply rate, and repair cycle time information must be maintained by the direct exchange activity.

(6) The stockage level of an item authorized for direct exchange is the sum of the repair cycle requirement and the resupply level. The total level is determined as follows:

(a) *Step 1.* Determine the average monthly repair rate during the latest 12-month period by totaling the "number repaired" entries for the previous 12 months and dividing by 12. If 12 months' experience is not available, use average for the number of months for which the monthly repair rate has been recorded.

(b) *Step 2.* Determine the average resupply (washout) rate per month by totaling the "external demands" entries for the previous 12 months and dividing by 12.

(c) *Step 3.* Determine the repair cycle time by comparing dates when the items are submitted with the date that items are returned from the repair activity. In determining the average repair cycle time, exclude any extraordinary awaiting parts delays and any intentional extended transit, storage, or repair process delays.

(d) *Example:*

1. Assumption:

Step 1. Average monthly demands	120
Step 2. (a). Average monthly repair rate ..	85
(b). Average monthly resupply rate	35

2. Computation:

(a) Using the following formula, compute the repair cycle requirement:

$$\frac{\text{Repair rate (85)} \times \text{repair cycle time (10) days}}{\text{Number of days in the month (30)}} = \text{Repair cycle requirement}$$

$$\frac{85 \times 10}{30} = \frac{850}{30} = 28 \text{ repair cycle requirement}$$

Add 25-percent safety level; thus 28 divided by a safety level factor of 4 equals $28 \div 4 = 7$

Authorized level equals $28 + 7$ for total of 35

(b) Using the following formula, compute the resupply level requirement:

Resupply rate (35) ÷ a resupply level factor of (4) = resupply level quantity of 8.7 or 9.

(e) Based on above computations, the total quantity authorized to be on hand, on order, and on maintenance request, is 35 (repair cycle requirement) plus 9 (resupply level requirement) for a total operating and safety level of 44.

(7) Table 7-3 based on formulas contained in (6) above have been developed to cover 1 to 30 days, repair cycle time and from 1 to 50 average monthly repair rate and 1 to 100 resupply rate. Use of this table permits direct exchange personnel to compute stock levels without any mathematical computation. The repair cycle requirement can be obtained from A, table 7-3 by reading across from the number representing the average number of items repaired in a month and reading down from the number of days representing the number of days in the repair cycle. The number where these two lines intersect is the authorized repair cycle requirement. The resupply level requirement can be obtained from B, table 7-3 by reading across from the number representing the average monthly resupply rate and selecting the number in the adjacent resupply quantity column. The total authorized stockage level is obtained by totaling the repair cycle requirement and the resupply level requirement. When the average monthly repair rate or the average resupply rate exceeds 50, the direct exchange stockage table can still be used. However, two separate actions are required. For example, if the monthly repair rate is 76, compute the quantity from line 50 and the quantity from line 26. The sum of the two levels obtained from the chart represent the total repair cycle requirement.

(8) A direct exchange list containing stock number, item description, end item application, and authorized stock level is prepared by the maintenance activity and submitted to the installation or organization commander or his designated staff officer for approval. Lists of approved direct exchange items will be distributed to all units and activities authorized to utilize these stocks.

7-4. Maintenance Facilities and Utilities Requirements

a. Maintenance shops range in size and scope from small-unit shops with organic maintenance responsibilities to large installations capable of complete overhaul and rebuilding of equipment. The size of the shop and the number of shop sec-

tions required are governed by the scope of maintenance activities and responsibilities, shop equipment authorized, and workload.

b. Most maintenance units are authorized sufficient equipment for their own utilities requirements. In areas where organic power equipment may be supplemented or replaced by local sources of power, planning for adequate power and lighting becomes necessary. For example, it is estimated that 1 watt per square foot of shop floor area is required for adequate overhead illumination of shop areas. Additional power must be provided for operation of shop machines and equipment, heating, and other uses.

c. Covered shop space requirements for maintenance units are given in table 7-4.

7-5. Vehicle Losses

Estimated daily losses in combat divisions of general-purpose vehicles destroyed and evacuated, number per 1,000 of actual vehicle strength, are given in table 7-5.

7-6. Floating Army Maintenance Facility

a. *General.* The Floating Army Maintenance Facility (FAMF) is a converted seaplane tender manned by the Aircraft Depot Maintenance Battalion (Seaborne) (TOE 55-465G) and a civilian crew (Military Sea Transportation Service). The battalion, composed of a headquarters (fig. 7-4) and an operating company (fig. 7-5), is a flexible, mobile organization, deployable to any part of the world on short notice.

b. *Mission.*

(1) To provide depot maintenance on Army aircraft components, avionics equipment, aircraft armament systems and parachutes.

(2) To provide direct and general support maintenance of Army aircraft, avionics equipment, aircraft armament systems, and parachutes to combat, combat support, and combat service support elements in a combat zone where facilities of land-based service organizations are not immediately available.

c. *Maintenance Capability.* The battalion is capable of providing —

(1) Limited airframe repair.

(2) Aircraft turbine engine rebuild, overhaul, repair and test.

(3) Component rebuild, overhaul, repair, and test.

(4) Communication, navigation, and surveillance equipment rebuild, overhaul, repair and test.

(5) Aircraft weapon systems rebuild, overhaul, repair and test.

Table 7-3. Direct Exchange Stockage Table

A. Repair Cycle Requirement

Repair cycle time (days)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
→ 1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2
2	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3
3	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4
4	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	5	5
5	1	1	1	1	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	4	4	4	5	5	5	5	6	6	6
6	1	1	1	2	2	2	2	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7
7	1	1	1	2	2	2	3	3	3	3	4	4	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	8	8	9
8	1	1	2	2	2	3	3	3	3	4	4	4	4	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	10
9	1	1	2	2	3	3	3	3	4	4	4	4	5	6	6	6	6	7	7	7	8	8	8	8	9	9	10	11	12	12
10	1	1	2	2	3	3	3	4	4	4	4	5	5	6	6	6	7	7	7	8	8	8	9	9	10	10	11	12	13	13
11	1	1	2	2	3	3	4	4	4	4	5	5	6	6	6	7	7	8	9	9	10	10	10	11	11	11	12	13	14	14
12	1	2	2	3	3	3	4	4	4	5	6	6	6	7	7	7	8	9	9	10	10	11	11	11	12	13	14	14	15	15
13	1	2	2	3	3	4	4	4	5	5	6	6	7	7	7	8	9	10	10	11	11	11	12	12	13	14	15	16	16	17
14	1	2	2	3	3	4	4	5	5	6	6	7	7	8	9	10	10	10	11	11	12	12	13	14	15	16	16	17	17	18
15	1	2	3	3	4	4	4	5	5	6	7	7	8	9	9	10	11	11	12	12	13	14	14	15	16	17	17	18	18	19
16	1	2	3	3	4	4	4	5	6	6	7	7	9	9	10	11	11	12	12	13	14	15	15	16	17	18	18	19	19	20
17	1	2	3	3	4	4	5	5	6	7	7	9	9	10	11	11	12	12	13	14	15	15	16	17	18	19	19	20	20	21
18	1	2	3	3	4	4	5	6	6	8	9	9	10	10	11	12	12	13	14	15	16	16	17	18	19	20	20	21	22	23
19	1	2	3	4	4	5	5	6	7	7	8	9	10	11	12	12	13	14	15	16	16	17	18	19	20	21	21	22	23	24
20	1	2	3	4	4	5	6	6	7	8	8	10	11	12	12	14	14	15	16	16	17	19	19	20	21	21	22	23	24	25
21	1	2	3	4	4	5	6	7	7	9	10	10	11	12	13	14	15	15	16	18	19	19	20	21	23	23	24	25	25	26
22	1	2	3	4	5	5	6	7	8	9	10	11	11	12	14	15	15	16	17	19	19	20	21	22	23	24	25	26	26	27
23	2	3	3	4	5	6	6	7	9	10	10	11	12	14	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
24	2	3	4	4	5	6	7	9	10	11	11	12	14	15	16	17	18	19	20	21	21	22	24	25	26	26	27	28	29	30
25	2	3	4	4	5	6	7	9	10	11	11	12	14	15	16	17	17	19	20	21	21	22	24	25	26	27	28	29	30	31
26	2	3	4	4	5	6	7	9	10	11	12	13	14	15	16	17	19	20	20	21	22	24	25	26	27	28	29	30	32	33
27	2	3	4	5	6	6	7	9	10	11	12	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29	30	31	33	34
28	2	3	4	5	6	7	8	9	10	11	12	14	15	16	17	19	20	21	22	24	25	25	26	28	29	30	31	32	34	35
29	2	3	4	5	6	7	9	10	11	12	13	14	15	16	17	19	20	21	22	24	25	26	27	29	30	31	32	33	35	36
30	2	3	4	5	6	7	9	10	11	12	13	15	16	17	19	20	21	22	24	25	26	27	29	30	31	32	33	34	36	38
31	2	3	4	5	6	7	9	10	11	12	14	15	16	17	19	20	21	22	24	25	26	28	30	31	32	34	36	37	38	39
32	2	3	4	5	6	8	9	10	11	13	15	16	18	19	20	21	22	24	25	26	27	29	30	32	33	35	37	38	39	40
33	2	3	4	5	6	8	10	11	12	14	15	16	18	19	20	21	22	24	26	27	29	30	31	33	34	36	38	39	40	41
34	2	3	4	6	7	9	10	11	12	14	15	16	19	20	22	23	24	25	26	27	29	31	32	34	36	38	39	40	41	42
35	2	3	4	6	7	9	10	11	12	14	16	17	19	20	22	23	25	26	27	29	30	32	34	35	37	39	40	42	43	44
36	2	3	4	6	7	8	10	12	14	15	16	17	19	21	22	24	25	26	28	30	31	32	34	35	38	40	41	42	44	45
37	2	3	4	6	7	9	10	12	14	15	16	18	20	21	22	24	26	27	29	31	32	33	35	36	38	41	42	44	45	46
38	2	3	5	6	7	9	10	12	14	16	17	19	20	22	23	25	26	28	30	31	32	34	36	38	40	42	43	45	47	48
39	2	3	5	6	7	9	11	12	14	15	17	19	21	22	23	26	27	29	31	32	33	35	37	39	41	43	44	46	48	49
40	2	4	5	6	9	10	11	13	15	16	18	20	21	23	25	26	28	29	31	33	35	36	38	40	42	44	45	47	49	50
41	2	4	5	6	9	10	11	14	15	16	19	20	22	23	25	27	29	30	32	34	35	37	40	42	43	45	46	48	50	51
42	2	4	5	6	9	10	12	14	15	17	19	21	22	24	26	27	29	31	32	35	36	38	39	41	44	46	47	49	51	52
43	2	4	5	7	9	11	13	14	16	18	20	21	22	25	26	29	30	31	32	36	37	39	40	42	45	47	48	50	52	54
44	2	4	5	7	9	11	13	15	16	19	20	22	24	25	27	29	31	33	35	37	38	40	41	43	46	48	49	51	53	55
45	3	4	5	8	10	11	13	15	16	19	20	23	24	26	28	30	31	33	35	38	39	41	42	44	47	49	50	52	54	56
46	3	4	6	8	10	11	13	15	17	19	20	23	24	26	29	31	33	35	36	37	40	42	43	46	49	50	52	55	56	58
47	3	4	6	8	10	11	13	15	17	20	21	24	25	27	30	33	34	35	37	39	41	43	45	47	50	51	53	56	57	59
48	3	4	6	8	10	12	14	16	18	20	22	24	26	28	31	33	34	36	38	40	42	44	46	48	51	52	54	57	58	60
49	3	4	6	9	10	13	14	16	19	20	23	25	26	29	31	33	34	36	39	41	43	45	47	49	52	53	55	58	59	61
→ 50	3	5	7	9	10	13	14	16	19	21	23	25	28	29	31	34	35	38	40	41	44	46	48	50	53	54	56	59	60	62
Repair cycle time (days)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

Table 7-3—Continued
B. Resupply Requirement

Resupply Rate	Resupply Quantity	Resupply Rate	Resupply Quantity	Resupply Rate	Resupply Quantity	Resupply Rate	Resupply Quantity
1	1	26	7	51	13	76	19
2	1	27	7	52	13	77	20
3	1	28	7	53	14	78	20
4	1	29	8	54	14	79	20
5	2	30	8	55	14	80	20
6	2	31	8	56	14	81	21
7	2	32	8	57	15	82	21
8	2	33	9	58	15	83	21
9	3	34	9	59	15	84	21
10	3	35	9	60	15	85	22
11	3	36	9	61	16	86	22
12	3	37	10	62	16	87	22
13	4	38	10	63	16	88	22
14	4	39	10	64	16	89	23
15	4	40	10	65	17	90	23
16	4	41	11	66	17	91	23
17	5	42	11	67	17	92	23
18	5	43	11	68	17	93	24
19	5	44	11	69	18	94	24
20	5	45	12	70	18	95	24
21	6	46	12	71	18	96	24
22	6	47	12	72	18	97	25
23	6	48	12	73	19	98	25
24	6	49	13	74	19	99	25
25	7	50	13	75	19	100	25

Table 7-4. Maintenance Covered Shop Space Requirements

1	2		3	4
TOE	Unit		Space allowances (sq m)*	Overhead clearance
2	8-500G	Team GC, med equip maint det	49	3.05
3	8-500G	Team GD, med equip maint det	70	3.05
4	8-667G	Army med dep	107	3.05
5	10-337G	QM air equip spt co, abn div	10,000	4.26
6	10-407G	QM air dlvr co	11,150	4.26
7	10-417G	Airdrop equip rep and sup co	3,000	4.26
8	10-500G	Team EA, air dlvr dep—fixed—50 tons	3,720	4.26
9	10-500G	Team EC, prcht and tex renv det—fixed—11,500	1,860	4.26
10	10-500G	Team ED, airdrop sup and svc det—fixed—11,500	465	4.26
11	10-500G	Team EF, SF prcht rigging det	465	4.26
12	10-500G	Team EG, air equip and spt det (abn)	465	4.26
13	10-500G	Team HA, refrigeration det—mbl	233	4.26
14	10-500G	Team HB, refrigeration det—smb	465	4.26
15	10-500G	Team HC, refrigeration det	698	4.26
16	29-134G	LE GS maint co	634	4.57
17	29-137G	Hv equip GS maint co	975	4.57
18	29-139G	Coll and clas co	585	4.57
19	29-207G	Lt maint co, DS	650	4.57
20	55-465G	Trans acft dep maint bn (seaborne)	3,430	

*Does not include open storage space that the units will require to support their shop operations.

Table 7-5. Divisional Vehicle Losses (Daily)

1	2	3
General type of operations for the force as a whole	Destroyed	Required repair by unit maintenance section ^a
2 Infantry division in attack of fortified position.....	27.....	27
3 Infantry division in attack of deliberate organized position.....	16.....	15
4 Infantry division in attack of hastily organized position.....	10.....	10
5 Infantry division in covering, security force, retirement, or delaying action.....	5.....	5
6 Infantry division in defense of position.....	9.....	7
7 Infantry division in inactive situation ^b	3.....	2
8 Infantry division in pursuit.....	5.....	5
9 Infantry division in assault of hostile shore.....	27.....	30
10 Infantry division in reserve.....	Negligible.....	^c 2
11 Armored division in attack.....	16.....	15
12 Armored division in inactive situation ^b	3.....	2
13 Armored division in pursuit or exploitation.....	5.....	8
14 Armored division in retirement or delaying action.....	5.....	5
15 Armored division in reserve.....	Negligible.....	^c 2

^a These quantities are in addition to the number in unit maintenance section each day for scheduled servicing.

^b Forces in contact, neither side attacking.

^c These figures do not apply during rehabilitation.

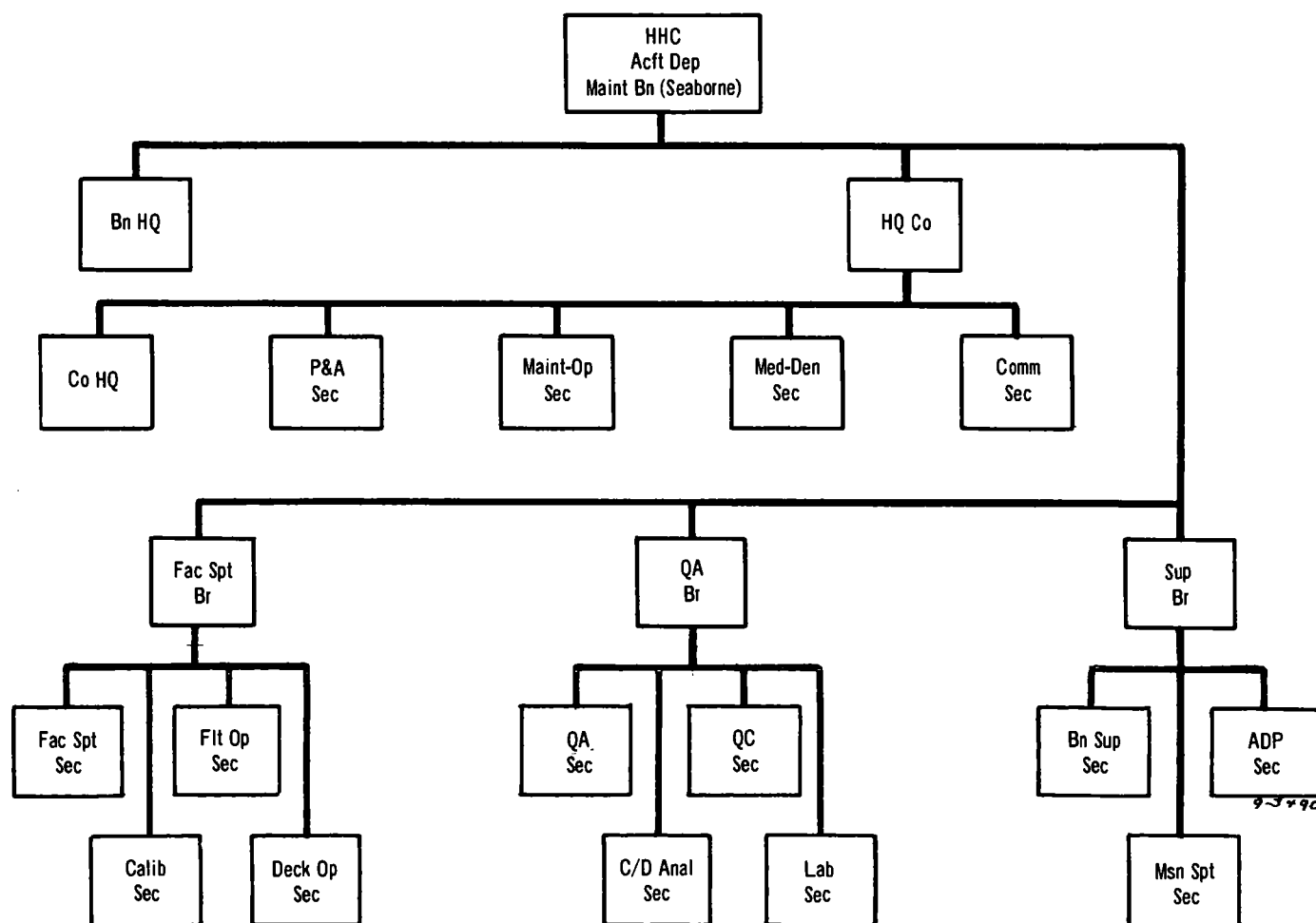


Figure 7-4. Headquarters and headquarters company, aircraft depot maintenance battalion (seaborne) (TOE 55-466G).

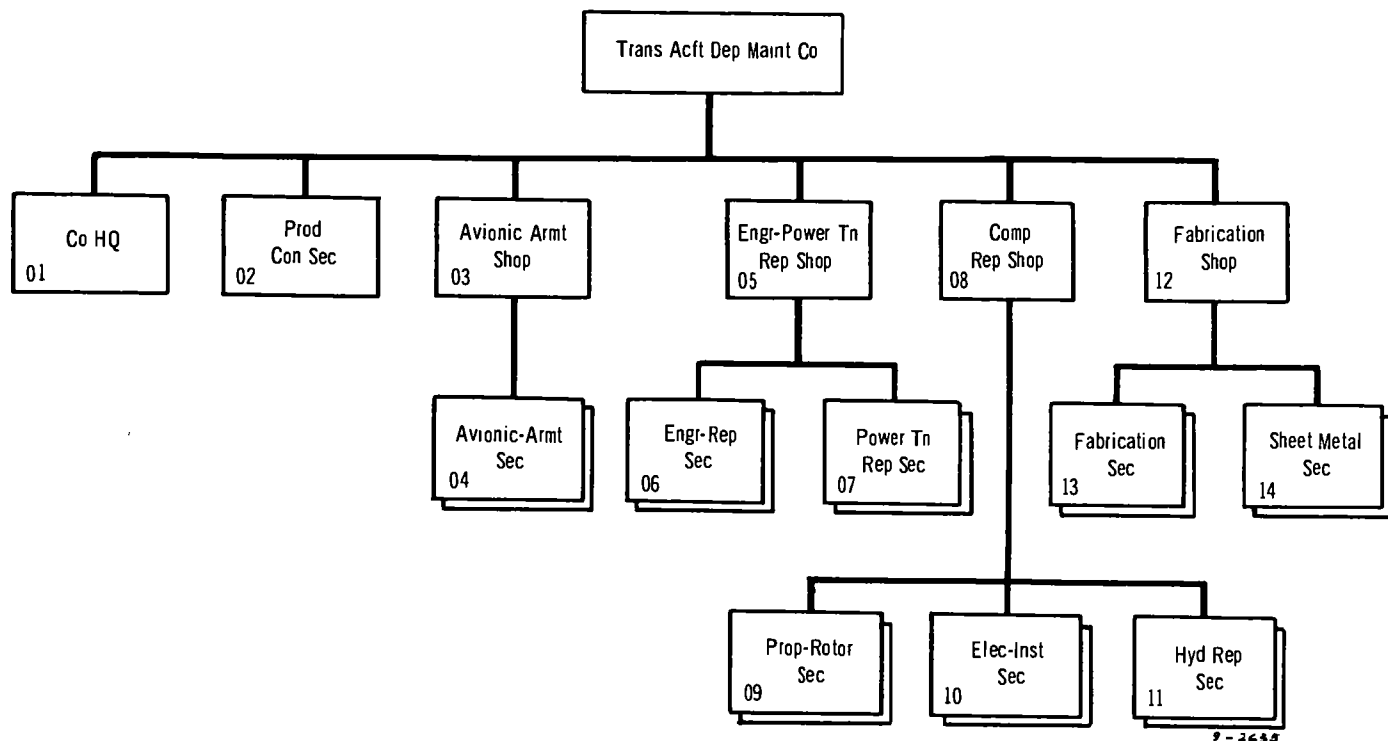


Figure 7-5. Aircraft depot maintenance company, aircraft depot maintenance battalion (seaborne) (TOE 55-467).

(6) Parachute repack and repair for personnel equipment, air delivery systems and ejection seat systems.

(7) Certain calibration services.

(8) Crash damage analysis facilities.

(9) Evaluation of low-time components for return to service.

(10) Evaluation of all types of components for determination of disposition.

(11) Extensive test and laboratory facilities.

(12) Other types of manufacturing, disassembly, repair and rebuild shops to include the following facilities:

(a) Sheet metal.

(b) Welding.

(c) Heat treatment.

(d) Machine.

(e) Chemical cleaning.

(f) Hydraulic.

(g) Instrument.

(h) Electrical.

(i) Bearing.

(j) Photographic laboratory.

(k) Chemical and magnetic particle inspection.

(l) Fluorescent penetrant.

(m) Inspection plating.

(n) Metallurgical laboratory, lab jet and reciprocating.

(o) Sonic cleaning.

d. *Functional Shop Capability.* Table 7-6 delineates the functional shop capability of the aircraft depot maintenance battalion.

e. *Vessel Characteristics.*

(1) The FAMF provides 37,000 square feet of shop space and 112,400 cubic feet of storage area. It can also transport 26 UH-1D helicopters, provide JP-fuel storage for large-scale helicopter operations, produce 85,000 gallons of potable water (50,000 gallons required for ship operations), load aircraft ammunition, pack 20 parachutes daily, provide limited medical support, and function as a helicopter resupply pad.

(2) The draft of the vessel is 24 feet, which can be reduced from 3 to 4 feet when necessary; however, ship operations dictate positioning the vessel in 40 feet of water with a minimum flow rate of 4 knots when operating for a prolonged period. At anchor, a 60-foot water depth is desirable, with a lateral distance of 2 nautical miles to the nearest shore and a swing clearance of 500 meters when secured to a buoy.

Table 7-6. FAMF Functional Shop Capability

Table 1. Shop Functional Shop Capacity									
	1	2	3	4	5	6	7	8	9
		Shop							
1	Remark	Engine and transmission	Component repair	Support platoon	Avionics	Armament	Crash damage analysis	Parachute repack	Total
2	Function.....	Turbine engines, transmission, rotor head, and fuel system.	Propeller, rotor, electrical, hydraulic, and instrument.	Machine, sheet metal, painting, welding, and diagnostic.	Communications, navigation, and surveillance.	Weapons and system fire control.	Technical tear-down and investigation of crash-damaged components.	Personnel, air delivery system, and ejection seat system.	-----
3	Assigned direct labor ¹ . Man hours per month: ²	58	52	42	18	4	3	4	181
4	Category II.....	14,268	12,792	10,332	4,428	984	738	984	44,526
5	Category III.....	15,428	13,832	11,172	4,788	1,064	798	1,064	48,146

¹ 100-percent TOE strength.

² Category II totals apply when the unit is employed in a direct support role. Category III totals apply when the unit provides general- and depot-level support.

Section II. CONSTRUCTION

7-7. Engineer Construction Troops

a. Battalion-Month. One battalion-month is the construction effort of an average experienced and properly equipped engineer construction battalion (CB) during 1 month. For general estimates, the battalion-month represents 125,000 man-hours of construction effort. This effort can be subdivided into 71,000 man-hours of horizontal construction (e.g., earthmoving, drainage, paving, aggregate production) and 54,000 man-hours for vertical construction (e.g., carpentry, plumbing, electrical, and painting). This productivity is based on 100-percent authorized unit strength and each man working a 10-hour day, 6-day week.

b. Force Estimates. The force estimates outlined herein should be used as a general planning guide only. They must be modified for known or expected conditions of particular operations.

c. Unit Equivalents. It is not practicable to state an average factor for construction effort of the various other engineer units, based on the battalion-month yardstick, as defined in *a* above, which is applicable to all types of construction projects. The quantity and type of equipment assigned to the unit and its training are important factors in determining unit effectiveness on a particular type of construction work. For example, an engineer combat battalion is more effective than an engineer CB in repairing roads in a combat zone (average factor 1.3), but an engineer combat battalion is much less effective than an engineer CB in constructing a new road in the communications zone (COMMZ), which requires considerable earthmoving (average factor 0.6). The factors in table 7-7 are based on the assumption that, in general, the average construction project in a combat zone requires much less heavy equipment than the average construction project in a COMMZ. The factors apply only to properly equipped engineer units of average experience. These factors should be used only in broad planning and do not apply to any one particular construction project. The many factors involved make it advisable that an experienced engineer officer, *familiar with the technical details of a particular project*, determine the type of engineer unit to be assigned to the construction project whenever practicable.

7-8. Roads

a. Road Nets.

(1) Construction and maintenance of roads in a theater of operations are held to the mini-

Table 7-7. Construction Effort Factors

1	Unit	Average construction effort factor	
		2 Combat Zone	3 COMMZ
2	Engr Construction Battalion.....	1.0	1.0
3	Engr cbt bn.....	1.3	0.6
4	Engr cbt bn plus LE co.....	1.4	0.9
5	Engr CB plus const spt co.....	1.2	1.4

imum required by the situation and are based on maximum use of the existing road net. The capacity of roads of various types, in short tons forward per day, is given in paragraph 6-40.

(2) Normally, the minimum two-lane road nets to be provided and maintained are as follows:

(a) In the combat zone —

1. One earth road per division forward of division rear boundary.

2. Two improved (e.g., gravel, crushed rock) roads per corps forward of field army rear boundary.

3. Lateral improved roads at 16-kilometer intervals in rear of division rear boundary.

4. Access roads as required at depots, supply points, and other installations in corps rear and field army service areas.

(b) In the COMMZ —

1. Two bituminous surface-treated roads to each field army service area. Connecting roads as required to ports and beaches.

2. Access roads as required at depots and other installations in the COMMZ.

b. Construction of New Roads.

(1) *Construction policy.* New road construction is undertaken only when absolutely necessary, and normally it includes only such items as detours to bypass demolitions and access road. The factors in tables 7-8 through 7-13 are given primarily for estimating rehabilitation as a percentage of the requirements for new construction.

(2) *Bridge and culvert requirements.* For planning, presumably 1 kilometer of new road requires 7.5 meters (24.8 feet) of bridging and from 3.7 culverts in flat terrain to 13 culverts in mountainous terrain.

(3) *Material requirements.* Material requirements for 1 kilometer of new road (including bridges, and asphalt for surfacing but not shoulders) are given in tables 7-8 and 7-9.

(4) *Fixed-bridge superstructure requirements per kilometer of road.* Table 7-10 provides fixed-bridge superstructure requirements for 1

Table 7-8. Material Requirements for 1 Kilometer of New Road

1	Type of road	2		3		4		5	
		Single-lane 3.7-m (12-ft) wide		Double-lane 7.3-m (24-ft) wide					
		STON	MTON	STON	MTON	STON	MTON	STON	MTON
2	Earth, graded and drained.....	2.5	1.9	3.1	2.9				
3	102-mm (4-in.) (two-lane 152-mm) (6-in.) stabilized earth or stone.....	3.1	2.5	6.2	4.3				
4	25-mm (1-in.) cold surface treatment on 102-mm (4-in.) (two-lane 152-mm) (6-in.) crushed stone.....	18.6	21.1	33.5	42.2				
5	25-mm (1-in.) surface treatment on existing base.....	13.6	18.6	27.3	37.8				
6	51-mm (2-in.) cold road mix, cold laid asphalt on 152-mm (6-in.) crushed stone.....	27.3	38.8	52.7	77.6				
7	76-mm (3-in.) cold road mix, cold laid asphalt on 152-mm (6-in.) crushed-run base.....	35.9	47.7	70.0	94.2				

Table 7-9. Gravel or Crushed-Rock Requirements for 1 Kilometer of New Road

1	Type of road	2		3		4		5	
		Surface 3.7-m (12-ft) wide		Surface 7.3-m (24-ft) wide					
		Cu m (cu yd)	STON	Cu m (cu yd)	STON	Cu m (cu yd)	STON	Cu m (cu yd)	STON
2	102-mm (4-in.) base*.....	371 (485)	726	742 (970)	1,452				
3	51-mm (2-in.) asphalt surface.....	185 (243)	363	370 (485)	726				
4	152-mm (6-in.) base*.....	557 (728)	1,082	1,114 (1,456)	2,164				
5	76-mm (3-in.) asphalt surface.....	278 (364)	546	556 (728)	1,092				

*Based on loose thickness. For compacted thickness, add 25 percent.

Table 7-10. Fixed-Bridge Superstructure Requirements for 1 Kilometer of Road*

Table 10.12a Bridge Superstructure Requirements for 1-lane, 10-m (33-ft) span									
1	2	3	4	5	6	7	8	9	
	Type of span	Percentage	Meters (feet)	One-lane			Two-lane		
				STON	MTON	Manhours	STON	MTON	Manhours
2	4.2- to 6.1-m (14- to 20-ft) timber— cl 25.....	20	1.5 (5.0)	2.7	2.6	45	3.0	4.0	75
3	9.2-m (30-ft) span, 6- to 27-in. WF beams—cl 60.....	21	1.6 (5.2)	NA	NA	NA	3.0	2.5	35
4	18.2-m (60-ft) span, 6- to 36-in. WF beams—cl 60.....	24	1.8 (6.0)	NA	NA	NA	3.6	3.2	46
5	24.3-m (80-ft) span, 9- to 36-in. WF beams—cl 60.....	12	0.9 (3.0)	NA	NA	NA	2.7	2.4	30
6	27.3- to 36.5-m (90- to 120-ft) span, 6- to 48-in. steel girders—cl 60.....	11	0.8 (2.7)	NA	NA	NA	3.2	2.6	30
7	39.6-m (120-ft) Bailey, through truss, DD.....	12	0.9 (2.9)	4.9	5.5	64	9.3	10.6	122
8	Total.....	100	7.6 (24.8)	NA	NA	NA	24.8	25.3	338

*Does not include substructure.

Table 7-11. Construction Effort in Man-Hours for 1 Kilometer of New Road

1		2	3	4	5	6	7
		One-lane plus 1.2-m (4-ft) shoulders			Double-lane plus 1.2-m (4-ft) shoulders		
1	Terrain	Grading only	Grading and 152-mm (6-in.) gravel	Grading 152-mm (6-in.) gravel and 76-mm (3-in.) asphalt	Grading only	Grading and 153-mm (6-in.) gravel	Grading 152-mm (6-in.) gravel and 76-mm (3-in.) asphalt
2	Swamp, avg 4-ft fill, no vegetation	2,090	4,640	7,440	3,100	6,850	8,250
3	Flat prairie, avg vegetation, 0 to 20% rock	1,140	2,840	4,710	1,690	4,190	5,130
4	Rolling, avg vegetation, 0 to 20% rock	3,730	5,800	7,650	5,520	8,270	9,300
5	Hilly, forested, 0 to 20% rock	7,200	9,240	11,480	10,670	13,670	14,800
6	Mountain, forested, no rock	9,600	11,810	14,210	14,230	17,480	18,700
7	Mountain, 1 to 20% rock	16,000	18,210	20,610	23,700	26,750	28,170
8	Mountain, 20% rock	21,600	23,810	26,210	32,000	32,250	36,470

kilometer of road, based on 7.5 meters (24.8 feet) of bridging per kilometer of route and on average percentages of the various types of standard military bridging spans. Timber bridge data are based on typical timber bridging with 4.6-meter (15-foot) wood stringers (TM 5-312). Semipermanent steel highway bridging is described in TM 5-312 and TM 5-302. One-land bridging is not applicable to wide flange (WF) beam bridges. Bridging is estimated at 75-percent timber and 25-percent steel stringers on wood substructures.

(5) *Construction effort.* Table 7-11 shows the net effective man-hours of engineer construction effort required for grading and surfacing 1 kilometer of new road to the following standards: one-land road (7.3-meter traffic land plus 1.2-meter shoulders); double-land road (7.3-meter traffic land plus 1.2-meter shoulders). The table is based on pit-bank run gravel, except for lines 6 and 7, which are based on crushed rock. Man-hour efforts for bridging and culverts are not included.

c. Road Rehabilitation. Materials and effort required to rehabilitate roads after action, in percentages of the materials and effort required for new construction, are shown in table 7-12.

Table 7-12. Rehabilitation—Equivalent Percentages

1	2	3
1	2	3
Rehabilitation of—	Equivalent percentages of new construction	
2 Roads.....	10 to 20	
3 Culverts.....	15	
4 Bridges.....	50 to 90	

d. Road Maintenance. After rehabilitation and not allowing for further damage in action, suitably trained and equipped engineer troops maintain roads on the basis of 9½ man-hours' net effective effort per kilometer of road per day.

e. Policy for Road and Bridge Construction.

(1) *Responsibility.* Bridging normally is on an area basis between the combat zone and the COMMZ. Theater army support command (TASCOM) forces take over bridging operations in rear of the field army area as rapidly as possible. Rearward elements assume bridge and road maintenance in forward areas as soon as the situation permits. Rearward engineer units replace tactical and other portable types of bridging with nonportable types as quickly as possible, strengthen bridging to carry successively heavier loads, and remove such tactical bridging as the situation justifies.

(2) *General bridge policy.* Tactical bridging normally is placed by corps engineers. Organizational equipment is replaced as quickly as possible by rearward engineers. Stocks of WF-beam, girder, I-beam, 27.4-meter (90-foot) pony truss bridging and timber trestle bridging with steel beams are available in depots for use in the COMMZ and in the combat zone when time and the tactical situation permit. Bailey bridging will be used primarily in the combat zone. Replaced and surplus bridging is returned to depots.

7-9. Railway Construction

a. New Construction.

(1) The railroad division used in planning includes 160 route kilometers of main line, single or double track, together with its terminal operating and maintenance facilities, fueling and watering facilities as required, and necessary signaling equipment or interlocking facilities for safe operation. Passing sidings on single-track lines, stations, and crossovers at double-track lines and stations are at intervals as required by the traffic. Normally, at least one spur or siding is provided at each station.

(2) Materials and man-hours (net effective) required for new construction of 1 kilometer of standard-gage (1.435 meters (4 feet 8½ inches)), single-track railroad are shown in table 7-13. Grading includes clearing based on average wooded terrain. Ballast is supplied from bank-run material and the average haul is 5 kilometers.

Table 7-13. Construction Requirements for 1 Kilometer of Standard-Gage Railroad

1	2	3	4
1	Item	STON	MTON
2	Grading.....		3,100
3	Ballast delivered.....		1,550
4	Track laying and surfacing.....		2,100
5	Bridging—13.25 m per km.....	79	68.9
6	Culverts—4 per km—average		
	12-m length.....	5	4.3
7	Ties—1,798.....	60	120.0
8	Rail—90 lb.....	98	43.0
9	Fastening (based on 11.9-m rail.....	21	6.2
10	Total.....	263	242.4

b. Rehabilitation. Table 7-14 reflects the rehabilitation requirements that can be anticipated for a 100-kilometer standard-gage, single-track line extending inland from a port, using average percentages of demolition over the entire line. FM 55-20 provides further information.

Table 7-14. Rehabilitation Requirements for 100 Kilometers of Railroad

Table 7. 14. Rehabilitation Requirements for 100 Kilometers of Railroad							
1	2	3	4	5	6	7	
Item	Quality per 100 km	Demolition percentage	Amount of rehabilitation	Materials ¹		Man-hours ¹ (thousands)	
				STON	MTON		
2 Main line.....	100 km.....	13	13 km.....	2,370	1,560	42.3	
3 Port trackage ²	3 km.....	100	3 km.....	894	683	13.7	
4 Passing sidings ²	4.5 km.....	80	3.6 km.....	1,075	821	10.6	
5 Station sidings ²	3 km.....	80	2.4 km.....	717	548	7.4	
6 Railway terminal ^{2, 3}	1 each.....	75	75 percent.....	4,410	4,230	100.0	
7 Water stations.....	2 each.....	100	2 each.....	84	131	5.6	
8 Fuel station.....	1 each.....	100	1 each.....	13	11	0.6	
9 Bridging.....	1,325 m.....	70	929 m.....	5,530	4,830	140.0	
10 Culverts.....	5,300 m.....	15	797 m.....	74	65	13.0	
11 Grading.....						21.8	
12 Ballast.....						27.4	
13 Total.....				15,167	12,879	382.4	

¹ Tunnels require special consideration. To repair (by timbering) a 15-m demolition at each end of a single-track tunnel (30 m total per tunnel), allow 70 STON, 87 MTON, and 3,000 man-hours.

² Estimate includes ties, rails, fastenings, turnouts, and track laying and surfacing. It assumes ballast is available at worksites.

³ Includes replacement of buildings 100 percent, ties 30 percent, and rail and turnouts 85 percent.

7-10. Water Terminal Construction

a. Approximate Planning Factors for Material and Man-Hour Requirements.

(1) Table 7-15, based on data in TM 5-301, shows the material and man-hour requirements for the construction of new water terminal facilities adequate for the handling of 1,440 short tons

of discharge dry cargo per day for 20-hour operation. This is a convenient unit because it is the wharf discharge rate of two ships, Victory-type, as given in paragraph 6-5d. The facilities include ship or lighterage wharf space (150 meters), access road from wharf to road net, and minimum covered and open storage.

Table 7-15. Port Construction Requirements

1	1	2	3	4	5	6	7	8	9	10
	Item	5-foot tide			15-foot tide			25-foot tide		
		STON	MTON	Man-hours	STON	MTON	Man-hours	STON	MTON	Man-hours
Port										
2	Steel-frame building, 2,434-sq m (building shell)	128	245	5,523	128	245	5,523	128	245	5,523
3	Wood-frame building, 2,716-sq m (building shell)	250	304	8,413	250	304	8,413	250	304	8,413
4	Railroad, 2.74-km	615	519	11,170	615	519	11,170	615	519	11,170
5	Road, 1.77-km, two-lane (macadam and asphalt)	59	75	13,480	59	75	13,480	59	75	13,480
6	Other construction on land	276	358	17,725	276	358	17,725	276	358	17,725
7	Railroad approach trestle, 27.5-m by 130-m	2,034	2,951	27,020	2,222	2,953	27,250	2,498	3,633	33,850
8	Pier, timber, 27.5-m by 150-m	2,420	3,629	29,040	2,652	4,037	29,200	2,956	4,485	35,430
9	Ramp, landing, 800-sq m			2,220			6,660			11,100
10	Wharf, lighterage, 11-m by 150-m	623	878	11,770	623	878	11,770	623	878	11,770
11	Total port, using steel frame	6,155	8,655	117,950	6,577	9,065	122,780	7,155	10,193	140,050
12	Total port, using wood frame	6,277	8,714	120,840	6,699	9,124	125,670	7,277	10,252	142,940
Wharves										
13	Wharf, timber, 18-m by 150-m	1,678	2,485	21,340	1,831	2,753	21,780	2,040	3,062	24,610
14	Wharf, railroad approach trestle, 30-m	282	405	5,900	310	451	6,040	343	401	6,820
15	Wharf, road approach, 30-m	84	121	3,230	91	133	3,240	100	146	3,460

(2) Table 7-16 shows the material and man-hour requirements for the rehabilitation of a 150-meter deep-draft wharf, clearance of debris, and new construction of other terminal facilities for 720 short tons per day. This includes repair of cratered wharf faces by timber and V-trestle construction to a width of 18 meters.

Table 7-16. Rehabilitation, 150-Meter Deep-Draft Wharf

1	1 Item	2 STON	3 MTON	4 Man-hours
2	Repair of 150-m deep-water wharf.....	1,375	2,910	25,000
3	1.12-km access road, asphalt-surfaced, 7.3-m wide.....	70	87	14,000
4	3.2-km railroad, including sidings.....	822	710	14,500
5	929-sq m (10,000-sq ft) covered storage.....	65	80	1,800
6	5,574-sq m (60,000-sq ft) open storage.....			50
7	Clearing debris.....			2,500
8	Total.....	2,332	3,787	57,850

(3) Table 7-17 shows the material and man-hour requirements for the rehabilitation of a 107-meter lighterage wharf, clearance of debris, and new construction of other port facilities for 720 short tons per day. This includes repair of cratered wharf faces by timber or steel-sheet pile.

Table 7-17. Rehabilitation, 107-Meter Lighterage Wharf

1	1 Item	2 STON	3 MTON	4 Man-hours
2	Repair of 107-m lighterage wharf.....	580	920	10,500
3	1.12-km access road, asphalt-surfaced, 7.3-m wide.....	70	87	14,000
4	3.2-km railroad, including sidings.....	822	710	14,500
5	929-sq m (10,000-sq ft) covered storage.....	65	80	1,800
6	5,574-sq m (60,000-sq ft) open storage.....			50
7	Clearing debris.....			1,100
8	Total.....	1,537	1,797	41,950

b. Construction Rate for Pile-and-Timber Wharves. Normally, one engineer construction company constructs 150 meters of deep-draft marginal wharf, or equivalent, in 6 days. These rates cannot be improved by using a force larger than a company on one wharf structure of this size because of the sequences necessary in pile driving, capping, bracing, and deck construction.

c. Demolition of Existing Facilities. Table 7-18, based on experience factors in the invasion of developed harbors, indicates the average percentages of demolition to be anticipated. In addition, the removal of sunken wrecks or blockships

may be required; normally, two or three in a small harbor, 10 or 20 in a large one. If the harbor entrance is narrow, it usually is found blocked.

Table 7-18. Average Demolition of Port Facilities

1	1 Facilities	2 Average demolition
2	Permanent wharves or quays	30 percent very badly damaged; early repair impracticable. 30 percent heavily damaged; much debris; reasonably early repair possible. 40 percent lightly damaged; less debris; early repair practicable.
3	Port cranes.....	100 percent destroyed.
4	Port warehouses.....	50 percent to 100 percent destroyed.

d. Utilities Required at Ship Wharves.

(1) *Fresh water.* With pressures normal in municipal water supply, one 4-inch pipeline with three 1½-inch outlets refills a Liberty ship's capacity of 115,000 gallons in 6 hours.

(2) *Illumination.* Five-hundred-watt incandescent lamps, mounted 10.5 meters above the wharf deck and spaced at intervals of 35 meters, provide adequate illumination averaging 1 to 2 foot-candles.

e. Construction Factors for Specific Types of Marginal Lighterage Wharves per 30 Meters. These factors are illustrated in table 7-19.

Table 7-19. Construction Factors, Lighterage Wharf

1	1 Type of construction	2 STON	3 MTON	4 Man-hours
2	Timber pile, 10.7-m wide, using 12-in piles	171	228.0	2,400
3	Timber crib, supporting timber bents, 10.7-m wide	143	193.0	2,800
4	Timber retaining wall (Wakefield pile) with earth or rubble fill.	21	30.5	1,300
5	Steel-sheet-piling retaining wall with earth or rubble fill.	27	25.0	1,100

f. Construction Factors for Floating Ponton Wharves. (See NAVDOCK T-401). A floating wharf suitable for a Victory or Liberty ship berth is 6 pontons wide by 72 pontons long or 13 by 123 meters. Four approaches, each 4 by 18 pontons, 8.5 by 33 meters, are usually adequate. Total area of wharf and approaches is 2,854 square meters. The construction factors are as indicated in table 7-20.

Table 7-20. Construction Factors, Pontoon Wharves

1	2	3	4
	Floating pontoon wharves	STON	MTON
2	Per 93 sq m	42	127
3	Wharf and approaches as above 2,854 sq m	1,290	3,900
			10,535

g. Construction Requirements for Over-the-Beach Discharge of Cargo. Construction requirements for over-the-beach discharge of cargo include the construction of ramps, hardstands, egress roads, and beach stabilization. In general, local materials are used. The length of the ramps varies, depending on beach gradient and tidal range. The length of the ramp can be computed by the following formula:

Beach gradient (in meters per hundred meters) $\times$ (tide range (in meters) $\div$ 1.2) = ramp length (in meters).

The man-hours required for the construction of 30 meters of various types of ramps, hardstands, and beach stabilization are as shown in table 7-21.

Table 7-21. Construction Requirements for Over-the-Beach Discharge of Cargo

1	2
	Man-hours
Facility	
2 Amphibious vehicle ramp, 17-m wide by 30-m long by 0.45-m deep.	930
3 Landing craft ramp (LCU/LCM/LST), 8.8-m wide by 30-m long by 0.45-m deep	480
4 Hardstands and beach stabilization, 30-m wide by 30.4-m long by 0.15 deep.	555
Maintenance:	
5 Ramps: 10 percent of initial effort per month.	---
6 Hardstands and beach stabilization: 10 percent of initial effort per quarter.	---

Note. See paragraph 7-8 for road construction factors.

7-11. Dredging

Dredging of harbors is a slow operation and therefore should be avoided if possible in a military operation. Likewise, plans should not call for dredging near quay walls because of the danger of damaging foundations. Generally, demolition debris can be cleared in front of berthing sites by using dragline or clamshell cranes. If dredging of harbor areas is unavoidable, the overall planning factors in table 7-22 may be used as a guide. Dredging quantities vary considerably with the type of equipment used, the distance of haul to the spoil area, the method of haul, and the kind of material being excavated (sand, mud, gravel, soft rock or coral, hard rock). Large-capacity shovels with clamshells or draglines may be mounted on barges and floated to the site.

7-12. General Construction

a. General. This paragraph presents planning factors for engineer standards and man-hours required for construction of facilities in the following categories (table 7-23):

- (1) Troop camps.
- (2) Administration.
- (3) Hospitals.
- (4) Depots.
- (5) Shops.
- (6) Iceplants and refrigerated storage.

(7) Personnel service buildings, including laundries, drycleaning plants, bakeries, recreation centers, and base post offices.

- (8) Prisoner of war (PW) camps.

b. Troop Camps.

(1) *Standards.* Troop camp requirements are estimated in six standards intended for varying degrees of permanence.

(a) *Standard 1.* Table of organization and equipment (TOE) tents; no engineer materials or effort involved.

(b) *Standard 2.* Class IV tents pitched by using troops; engineer effort for roads and site preparation.

(c) *Standard 3.* Buildings with floors for administration, bathhouses, infirmaries, storehouses, and kitchens. Class IV tents with floors for housing and with earthen floors for all other purposes. Roads within the installations stabilized with local materials. Water piped from central storage tank to infirmaries, bathhouses, and kitchens. Electric distribution to buildings. Pit-type latrines.

(d) *Standard 4.* Buildings with floors for all purpose except housing, for which there are class IV tents with floors and wood frames. Roads within the installations stabilized with local materials. Water piped from central storage tank to infirmaries, bathhouses, kitchens, and camp exchange. Electric distribution to all facilities. Pit-type latrines.

(e) *Standard 5.* Buildings with floors for all purposes; otherwise the same as standard 4 above.

(f) *Standard 6.* Water piped from central storage tank to latrines; latrines equipped so that waterborne, untreated sewage carried 300 meters beyond the confines of the camp; bituminous surfacing of roads within the installations; otherwise, the same as standard 5 above.

(2) *Structures.* Structures are prefabricated (metal-type) or wood frame for all climates. Table 7-23 indicates man-hour requirements, based on use of metal prefabricated buildings for

Table 7-22. Dredging Planning Factors

1	Remark	2	3	4	5
		Type of dredge			
		Hydraulic suction ¹	Dipper	Clamshell or orange peel	Seagoing hopper ²
2	Size.....	12- to 18-in pipe	1.5- to 12.0-cu m	1- to 7-cu m	385- to 6,230-cu m
3	Operating personnel.....	Varies from 12- to 90-man crews, depending on size of dredge and number of shifts being worked.			
4	Operating characteristics and principal use.....	Best in soft or loose material, but can also dig firmer material, varying from compacted sands and conglomerates to some types of coral.	Clay, loose rock, or debris excavation. Generally requires loading in scows for disposal.	Dredging in limited areas, caisson work, debris clearance. Generally requires loading in scows for disposal. The material dredged is of the softer type, such as silt and mud.	Outer harbor work. Spoil area may be several miles away.
5	Maximum swells affecting operations	0.9 m (3 ft)	1.5 m (5 ft)	1.5 m (5 ft)	Designed for dredging in rough water.
6	Maximum dredging depth.....	7.6-19.8 m (25-65 ft)	6.0-15.2 m (20-50 ft)	Great depths	11.0-18.2 m (36-60 ft)
7	Average daily capacity ³	2,180 cu m (12-in pipe)	1,500 cu m (1.5 cu m dipper).	450 cu m (1-cu m clam-shell or orange peel).	4,000 cu m (385-cu m hopper).
		20,000 cu m (28-in pipe)	6,900 cu m (12.0-cu m dipper).	3,200 cu m (7-cu m clam-shell or orange peel).	15,000 cu m (6,230-cu m hopper).

¹ Disposal is by pipeline to upland disposal areas or in water areas a sufficient distance from the dredged areas to prevent significant infill.

² Hopper dredges are used primarily in dredging inlet channels leading from exposed offshore areas to a sheltered harbor. In a military operation it is probable that all other dredging will be accomplished with local dredges of other types.

³ Based on 24-hour operation at 60-percent effective time.

the various standards of camps in the temperate climate, for from 250 to 3,000 men. For wood-frame buildings, when used, increase man-hour requirements by 8 to 20 percent (higher figure for highest standard). For the dry cleaning plant and laundry, the boiler house is wood frame only (marked with footnote in table 7-23). Fine and coarse aggregate requirements are not included in material figures because these requirements are assumed to be available in usable form within a sort-hauling distance (less than 8 kilometers).

c. Administration Facilities. Estimates are based on three standards: standard 3, standard 4, and standard 6. Standard specifications are the same as for troop camps.

d. Hospitals. Estimates are based on four standards as follows:

(1) *Standard 2.* Facilities in tents with some buildings (clinic, latrines, building for servicing ward patients); hospital tent frames; personnel tents pitched by using troops with no engineer material or assistance. Water piped from central storage tank to necessary facilities. Concrete floors for tentage with frames and for buildings. Waterborne sewage in buildings and pit latrines for other facilities. Roads unimproved. Electric distribution to all facilities.

(2) *Standard 3.* Same as standard 2, except that all sewage waterborne, roads stabilized, and additional buildings provided.

(3) *Standard 4.* Same as standard 3, except that all tents framed and floored and additional buildings provided.

(4) *Standard 6.* Same as standard 4, except that buildings provided for all facilities and roads bituminous surfaced.

e. Depots. Estimates are based on four standards of construction for covered and open dry cargo storage and three standards for ammunition storage as follows:

(1) *Dry cargo storage.*

(a) *Standard 2.* Tents for all facilities requiring cover. Open storage cleared, graded, and drained. Roads graded, but not surfaced.

(b) *Standard 3.* Sheds for covered storage; tents with floors for administrative space; without floors for other facilities requiring cover. Roads stabilized. Railroad sidings to open storage areas. Drainage and fencing provided when required.

(c) *Standard 4.* Same as standard 3 except open storage on 152 millimeters (6 inches) of crushed stone with asphalt binder. Administration in tents and latrines in buildings.

(d) *Standard 5.* Closed buildings for covered storage and administrative facilities. Bi-

tuminous-surfaced main access roads to covered and open storage areas; other interior roads stabilized. Railroad sidings to storage areas. Drainage and fencing provided when required. Electricity provided to all buildings.

(2) *Ammunition storage.*

(a) *Standard 2.* Tents for 10 percent of the ammunition tonnage and for administrative facilities. Open storage areas cleared and graded. Latrines in wood-frame buildings. Access roads graded but not surfaced.

(b) *Standard 3.* Sheds for 10 percent of the ammunition tonnage. Buildings for administrative facilities. Access roads and parts of open storage areas stabilized with local materials. Railroad sidings to storage areas.

(c) *Standard 5.* Ten-percent storage, administrative, checkpoint, shop, and latrines in buildings.

(3) *Shops.* Phase I construction (table 7-23) is described as structural wall, including fastings and roof frame.

f. PW Camps. Estimates are based on four standards of permanence (2, 3, 4, and 5) as follows:

(1) *Standard 2.* Tents with earthen floors for all facilities. Bucket-type latrines. Engineer effort required for construction of security fencing, guard towers, and stabilized roads. Open-ditch drainage.

(2) *Standard 3.* Buildings for bathhouse, kitchen, latrines, and generators. All other facilities in tents. Concrete floors in buildings and tents. Electricity to all buildings and tents except PW housing. Floodlights. Other construction as in standard 2.

(3) *Standard 4.* Personnel housed in framed tents. Bucket-type latrines. Other accommodations in buildings. Concrete floors for tents and buildings. Other construction as in standard 3.

(4) *Standard 5.* All accommodations in buildings. Other construction as in standard 4.

g. Bivouacs, Camps, and Billets.

(1) *Bivouac areas.* The bivouac area of an infantry battalion varies from 0.093 square kilometer to 2.6 square kilometers as indicated by the situation. Considerations that affect the area required are the dispersion necessary to reduce the threat of enemy attack, the amount of cover and concealment available, and the characteristics of the terrain. The approximate minimum area required by a unit may be estimated as indicated below.

Note. Both methods should be used and the larger figure should be chosen.

Table 7-23. Construction Requirements
a. Troop Camps, Administration Facilities, Hospitals, Storage Facilities, and Prisoner of War Camps

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Item	Man-hours	Electric (kw)	Water/Sewage (M gpd)	Site area (sq m)	Man-hours	Electric (kw)	Water/Sewage (M gpd)	Site area (sq m)	Man-hours	Electric (kw)	Water/Sewage (M gpd)	Site area (sq m)	Man-hours	Electric (kw)	Water/Sewage (M gpd)	Site area (sq m)
	Number of men	<i>Troop Camps</i>															
		Standard 3				Standard 4				Standard 5				Standard 6			
2	250	7,570	2.2	3.75	31,155	11,070	5.4	3.75	31,155	13,590	5.5	3.75	31,155	14,650	5.5	6.25	31,155
3	500	13,740	7.9	7.50	80,000	23,120	17.3	7.50	80,000	27,890	17.3	7.50	80,000	28,270	17.4	12.50	80,000
4	1,000	28,690	12.6	15.00	164,610	44,250	31.6	15.00	164,610	53,260	31.3	15.00	164,610	53,140	31.4	25.00	164,601
5	1,500	39,555	15.4	22.50	208,000	61,240	39.4	22.50	208,000	73,030	39.1	22.50	208,000	73,900	39.0	37.50	208,000
6	3,000	72,120	27.0	45.00	424,000	118,180	78.0	45.00	424,000	141,970	77.5	45.00	424,000	145,640	78.4	75.00	424,000
	Space (sq m)	<i>Administration Facilities</i>															
		Standard 3				Standard 4				Standard 5				Standard 6			
7	930	6,400	12.6	0.25	-----	7,120	12.6	0.25	-----	-----	-----	-----	-----	7,960	12.6	1.25	0.875
8	2,320	15,275	28.5	0.63	-----	16,010	28.5	0.63	-----	-----	-----	-----	-----	17,290	28.5	3.12	2.180
9	4,650	27,850	56.5	1.25	-----	28,760	56.5	1.25	-----	-----	-----	-----	-----	30,810	56.5	6.25	4.375
	Number Beds	<i>Hospitals</i>															
		Standard 2				Standard 3				Standard 4				Standard 6			
10	100	29,050	81.2	5.0/2.5	40,470	52,050	111.0	5.0/3.5	40,470	64,740	135.0	5.0/3.5	40,470	75,830	144.0	5.0/3.5	40,470
11	200	38,530	104.1	10.0/5.0	54,500	71,825	184.3	10.0/7.0	54,500	83,530	194.7	10.0/7.0	54,500	106,975	208.0	10.0/7.0	54,500
12	300	60,950	146.0	15.0/7.5	74,500	99,740	246.0	15.0/10.5	74,500	115,520	285.8	15.0/10.5	74,500	136,515	302.0	15.0/10.5	74,500
13	500	77,670	193.9	25.0/12.5	100,000	123,690	309.0	25.0/17.5	100,000	161,700	411.1	25.0/17.5	100,000	186,220	435.0	25.0/17.5	100,000
14	750	98,720	248.0	37.5/18.75	128,500	165,360	407.0	37.5/26.25	128,500	205,840	540.5	37.5/26.25	128,500	249,990	575.0	37.5/26.25	128,500
15	1,000	111,820	276.0	50.0/25.0	157,500	182,840	503.0	50.0/35.0	157,500	245,260	660.0	50.0/35.0	157,500	488,760	698.0	50.0/35.0	157,500
	Space (M sq m)	<i>Storage, Dry Cargo</i>															
		Standard 2 (open)				Standard 4 (open)				Standard 3 (covered)				Standard 5 (covered)			
16	1.11	-----	-----	-----	-----	-----	-----	-----	-----	4,120	-----	-----	20,600	7,200	3.1	-----	20,600
17	2.32	-----	-----	-----	-----	-----	-----	-----	-----	6,055	-----	-----	22,600	10,920	6.7	-----	22,600
18	4.65	3,048	-----	-----	-----	5,400	-----	-----	-----	9,400	-----	-----	39,500	20,010	13.3	-----	39,500
19	9.30	5,828	-----	-----	-----	9,420	-----	-----	-----	9,495	-----	-----	63,750	23,340	27.2	-----	63,750
20	18.60	11,018	-----	-----	-----	17,810	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
	Capacity (tons)	<i>Storage, Ammunition (10 Percent Covered, 90 Percent Open)</i>															
		Standard 2				Standard 3				Standard 5							
21	5,000	66,677	-----	-----	184,000	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
22	15,000	-----	-----	-----	-----	221,800	-----	-----	700,000	281,939	-----	-----	700,000	-----	-----	-----	-----
	Number of PW	<i>Prisoner of War Camps</i>															
		Standard 2				Standard 3				Standard 4				Standard 5			
23	250	6,060 ^a	-----	1.25	40,000	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
24	500	10,420 ^a	-----	2.50	72,000	19,720	39.9	5.00	72,000	25,970	44.0	5.00	72,000	30,590	47.6	5.00	72,000
25	1,000	13,710 ^a	-----	5.00	92,000	29,770	65.9	10.00	92,000	39,960	73.1	10.00	92,000	48,970	73.3	10.00	92,000
26	2,000	22,740 ^a	-----	10.00	160,000	54,030	126.8	20.00	160,000	75,800	138.3	20.00	160,000	93,190	145.5	20.00	160,000
27	4,000	60,860 ^a	-----	20.00	376,000	130,810	394.0	40.00	376,000	-----	-----	-----	-----	199,150	430.4	40.00	376,000
28	4,000 ^b	51,900 ^a	-----	20.00	332,000	102,360	283.0	40.00	332,000	-----	-----	-----	-----	136,960	303.2	40.00	332,000

^a Wood frame only plus tentage material.

^b Oriental.

Table 7-23—Continued
b. Shop, Refrigerated Storage, Iceplant, and Personnel Service Facilities

1	2	3	4	5	6
Facility	Size	Capacity	Man-hours	Electric (kw)	Water (M gpd)
2 Shop (phase I construction)	12.2- by 30.5-m	0.37 M sq m	818	-----	-----
3 Shop (phase I construction)	18.3- by 91.5-m	1.67 M sq m	2,820	-----	-----
4 Shop (phase I construction)	24.0- by 73.2-m	1.78 M sq m	3,041	-----	-----
5 Warehouse, refrigerated	118-sq m	-----	4,171	73.0	-----
6 Warehouse, refrigerated	223-sq m	-----	5,763	103.0	-----
7 Warehouse, refrigerated	1,635-sq m	-----	33,470	539.0	0.90
8 Iceplant	1.0-ton	-----	870	0.9	0.25
9 Iceplant	3.6-ton	-----	1,120	15.0	1.00
10 Iceplant	15.0-ton	-----	2,950	47.0	4.00
11 Drycleaning plant, with boilerhouse	-----	1,000-man	3,620 ^a	34.5	0.21
12 Drycleaning plant, with boilerhouse	-----	2,500-man	4,060 ^a	46.0	0.26
13 Drycleaning plant, with boilerhouse	-----	5,000-man	4,750 ^a	74.5	0.40
14 Laundry, with boilerhouse	-----	2,500-man	6,650 ^a	35.4	22.50
15 Laundry, with boilerhouse	-----	5,000-man	8,620 ^a	69.0	47.00
16 Laundry, with boilerhouse	-----	10,000-man	15,250 ^a	117.4	83.00
17 Base post office	1,040-sq m	-----	6,270	8.2	0.09
18 Base post office	1,490-sq m	-----	8,790	21.8	0.13
19 Base post office	7,400-sq m	-----	39,320	49.4	0.52
Recreation center:					
20 Standard 3	-----	5,000-man	-----	21.4	10.00
21 Standard 4	-----	5,000-man	21,790	28.3	10.00
22 Standard 5	-----	5,000-man	29,400	40.3	10.00
23 Standard 4	-----	10,000-man	36,380	52.5	20.00
24 Standard 5	-----	10,000-man	57,209	79.5	20.00

^a Wood frame only plus tentage material.

(a) *Vehicle dispersion.* When required dispersion of the vehicles with the unit governs, use the following formula:

$$\frac{V \times D^2}{K} = \text{area required, when}$$

V = number of vehicles with the unit

D = desired dispersion between vehicles

K = conversion factor, as appropriate, to reduce the area to acres, hectares, square miles, or square kilometers

Example: Assume that an infantry battalion has 200 vehicles and dispersion of 100 meters between vehicles is desired. Find the area required.

$$\frac{200 \times (100)^2}{1,000,000 \text{ (sq m per sq km)}} = 2 \text{ sq km}$$

Personnel will be distributed throughout the area.

(b) *Tent camps — capacity.* Medium general-purpose tent, normal assignment — from 12 to 16 men per tent; area required for an infantry battalion camp (open ground) — approximately 0.13 square kilometer; estimate of area required — 50 square meters per man; 100 square meters per vehicle.

(2) *Data on tentage.* Table 7-24 is extracted from FM 20-15 and FM 20-16.

(3) *Space allowances for quarters under theater of operation conditions.*

(a) Normal — 40 square feet of floor space and 40 cubic feet of airspace per person.

(b) Emergency — 50 percent of the above.

(4) *Billets.* In hostile or liberated territory, the capacity of a locality for billeting is approximately as follows:

Rich farming country.....	5 troops per inhabited dwelling
Cities.....	2 troops per inhabited dwelling
Average American city.....	20 troops per inhabited dwelling
Vacant buildings and dwellings in average city (civilians may be caused to move to vacancies to concentrate military activities).	10 percent of population
With civilians furnishing subsistence.	10 percent of population for 1 week

h. Housing Requirements Besides Troop Camps. Besides those facilities provided for normal housing of troops, it is usually necessary to provide certain installations, based on the percentages of the theater population shown in table 7-25.

i. Office Space. Space allowances for offices under theater of operation conditions are 60 square feet per person employed plus 10 square feet per drafting board.

j. Prefabricated and Standard-Frame Buildings.

(1) The following are the basic units for portable prefabricated, V-lock steel buildings:

(a) Barrack with basic dimensions of 20 feet by 20 feet, 30 feet by 40 feet, 40 feet by 50

feet 8 inches high and expandable in 10-foot-length increments.

(b) Warehouse with basic dimensions of 40 feet by 100 feet by 20 feet high and expandable in 20-foot-length increments.

(c) Shop with basic dimensions of 40 feet by 100 feet by 12 feet high and expandable in 10-foot-length increments.

(d) Units of (a), (b), and (c) above are interconnectable without use of especially fabricated parts.

(2) Standard-frame buildings are constructed in various dimensions and designs from standard materials listed in TM 5-302. The large lumber and man-hour requirements involved normally restrict this construction to special-purpose buildings, such as refrigerated warehouses, ice-plants, laundries, drycleaning plants, special shops, and facilities for frigid climates.

7-13. Bulk Petroleum Storage and Distribution

a. General. Tables 5-5 through 5-9 contain data pertaining to petroleum; table 5-10 contains types and capacities of pipelines. See TM 5-343 for descriptions, sizes, and operating characteristics of pipeline equipment; AR 701-5 for supply service responsibilities; and TM 10-1100 series for petroleum pipeline and terminal operating procedures and techniques. Engineer troop units construct petroleum distribution systems. A complete pipeline system includes —

(1) Tanker discharge facilities and receiving tank farm at a port or beach (marine terminal).

(2) One or more parallel pipelines.

(3) Tank farms, which are generally spaced from 80 to 120 kilometers apart along the system and vary from 50,000- to 1,000,000-barrel capacity, depending on supply needs and specified theater levels of supply.

(4) Dispensing facilities, which are provided at tank farms and supply point.

b. Pipelines. Four-, six-, and eight-inch diameter, lightweight pipe is standard for military pipeline systems. On level terrain, pump stations are spaced 12.9 kilometers apart for 4-inch lines and 27 kilometers apart for 6- and 8-inch lines. Submarine ship-to-shore lines are 8-inch heavy welded lines and 12- to 16- and 20-inch concrete coated lines running from the offshore tanker mooring to the receiving tank farm. They are provided by the Corps of Engineers as part of the equipment in marine terminal installations. For general planning, the pipeline capacities given for standard military lightweight tubing in table 7-26 may be used.

Table 7-24. Tentage Data

1	2	3	4	5	6	7	8
Line item number	Type of tent	Length (ft)	Width (ft)	Peak height (ft)	Floor area (sq ft)	Weight packed (lb)	Volume packed (cu ft)
2	V47071..... Arctic, 10-man, FMWWR*, hexagonal.....	15.2	17.5	8.5	198.9	76.0	7.3
3	V47345..... Assembly, M-1942, FMWWR*.....	80.0	40.0	18.0	2,856.5	1,755.0	100.0
4	V47482..... Command post, M-1945, FMWWR*.....	20.6	10.0	9.0	172.0	257.0	9.9
5	V47756..... Aviation maintenance, small, frame.....	10.0	12.0	12.0	120.0	361.0	26.8
6	V47893..... Frame-type, balloon inflation, M-1957.....	15.2	14.0	12.8	210.0	930.0	56.5
7	V48161..... Maintenance, frame, FMWWR*.....	32.0	20.0	14.0	640.0	2,057.0	237.0
8	V48304..... Maintenance, frame, insulated, sectional.....	16.0	16.0	8.0	256.0	2,410.0	259.5
9	V48578..... General-purpose, large, FMWWR*.....	52.0	18.0	12.0	936.0	820.0	69.0
10	V48989..... General-purpose, medium, FMWWR*.....	32.7	16.0	10.0	512.0	634.0	33.0
11	V49126..... General-purpose, small, FMWWR*, hexagonal.....	15.2	17.5	10.5	198.9	186.0	8.0
12	V49537..... Hexagonal, lightweight, M-1950, FMWWR*.....	11.4	13.3	8.5	113.2	56.0	3.8
13	V49948..... Kitchen, flyproof, M-1948.....	18.0	12.0	9.0	216.0	420.0	26.2
14	V50058..... Maintenance shelter, FMWWR*.....	26.8	18.2	14.0	486.8	1,255.0	84.0
15	V50496..... Mountain, two-man.....	6.8	14.5	3.6	30.8	9.5	0.7
16	V50633..... Nike-Hercules, air-supported.....	71.4	15.4	12.9	995.0	1,425.0	198.0
17	V50907..... Radome, air-supported, circular.....	24.0	24.0	19.7	452.0	1,029.0	85.0
18	V52414..... Maintenance, missile test shop.....	6.0	8.8	8.6	40.0	50.0	3.0
19	V52551..... Missile equipment console, pulse acquisition radar, front.....	6.7	8.0	7.7	50.0	40.0	4.0
20	V52688..... Missile equipment console, pulse radar, rear.....	4.0	8.0	8.6	26.0	40.0	3.5
21	V52825..... Missile equipment console, range radar.....	6.8	8.3	8.3	55.7	60.0	4.0

*Fire, mildew, water, and weather-resistant.

Table 7-25. Housing Requirements Besides Troop Camps

1	2
Facility	Percentage of theater troops
2 Recreation center.....	5 of total.
3 Reception center.....	5 of total.
4 Replacement depot.....	3 of total.
5 Casual camp.....	1 of total.
6 Ground troop training center.....	5 of all ground forces.
7 Service force training center.....	5 of all service troops.
8 Labor camp.....	5 of prewar population in area.
9 Temporary refuge for displaced persons.....	5 of prewar population in area.
10 Military prisoners.....	1 of total.
11 Undesirable civilians (saboteurs, etc.).....	5 of prewar population in area.

Table 7-27 provides petroleum products pipeline construction requirement. Although military lightweight steel tubing ordinarily forms most of the length of a pipeline, it normally is not buried, nor is it used for submerged stream crossings or in populated areas and locations where hazards of fire and damage are acute. In situations where lightweight tubing is unsuitable, standard weight, commercial type (API) line pipe is the selected military standard for use in petroleum pipelines. Reference should be made to TM 5-343 for detailed information and data on pipeline equipment and for discussion of pertinent pipeline planning considerations where deliberate planning and estimates are needed.

c. Tank Farms.

(1) Based on the theater level of supply the

Table 7-26. Capacity of Standard Military Lightweight Steel Tubing

1	2	3	4	5	6	7	8
	Inside diameter of line (in)	Nominal tubing size (in)	Nominal design capacity (bph)	Emergency capacity (bph)	Safe working pressure (psi)	Maximum working pressure (psi)	Gallons per day
2	4.....	4.350	355	393	600	750	298,000
3	6.....	6.415	785	1,000	600	750	660,000
4	8.....	8.415	1,355	1,730	500	625	1,140,000
5	12.....	12.481	7,150	11,400	400	500	6,000,000

Table 7-27. POL Pipeline Construction Requirements

1	2	3	4	5
Type	STON	MTON	Manhours	Rate of construction (km per day)
2 4-in by 12.9-km, with 355-bph pump station.....	185	221	4,790	12.9
3 6-in by 27-km, with 785-bph pump station.....	571	893	10,600	12.6
4 8-in by 27-km, with 1,355-bph pump station.....	589	1,544	11,470	8.4

Table 7-28. POL Tank Farm Construction Requirements

1	2	3	4	5	6
Installation	Capacity (M bbl)	Site area (sq m)	STON	MTON	Man-hours
2 Marine terminal, with submarine pipeline.....	200	110,000	1,454	2,453	49,280
3 Marine terminal, with jetty.....	200	-----	1,783	2,713	56,180
4 Marine terminal, with existing dock.....	200	-----	1,101	2,034	43,580
5 Marine terminal, with submarine pipeline.....	400	186,000	3,452	6,740	113,590
6 Marine terminal, with jetty.....	400	-----	3,493	6,660	115,830
7 Marine terminal, with existing dock.....	400	-----	2,811	5,981	103,230
8 Marine terminal, with submarine pipeline.....	1,000	440,000	6,650	13,147	242,800
9 Marine terminal, with jetty.....	1,000	-----	6,692	13,067	245,040
10 Marine terminal, with existing dock.....	1,000	-----	6,010	12,389	232,440
11 Tank farm, with 6-in. pipeline and accessories.....	50	42,000	372	575	12,975
12 Tank farm, with 8-in. pipeline and accessories.....	50	-----	397	610	13,621
13 Tank farm, with 6-in. pipeline and accessories.....	100	74,000	635	992	20,963
14 Tank farm, with 8-in. pipeline and accessories.....	100	-----	670	1,047	21,933
15 Tank farm, with 8-in. pipeline and accessories*.....	150	75,000	917	1,450	29,660
16 Tank farm, with 8-in. pipeline and accessories*.....	200	76,000	7,031	872	33,695
17 Tank farm, with 12-in. pipeline and accessories*.....	200	-----	7,801	1,033	34,689
18 Tank farm, with 8-in. pipeline and accessories*.....	250	102,000	1,420	2,228	45,025
19 Tank farm, with 12-in. pipeline and accessories*.....	250	-----	1,585	2,514	46,295
20 Tank farm, with 6-in. pipeline and accessories.....	400	152,000	2,642	4,186	81,155

*Using 10,000-barrel bolted steel tanks.

planner determines the tank farm construction requirements. This may vary from a 30- to 60-day level, depending on the distance of tanker haul and probability of tanker losses through enemy action. Using the planning factor stated in paragraphs 5-6 and 5-7, the amount of construction required may be estimated by the following formula:

Number of divisions (plus air support) × daily fuel requirement × number of days of level of supply - available existing storage in theater = total storage construction requirement.

(2) Table 7-28 provides data for estimating tank farm construction along a pipeline system. These data include tanks, pipe manifolds to the individual tanks, pumps, valves, etc., necessary for operation of the tank farms. Current doctrine for dispersion of facilities prescribes that not more than 250,000 barrels of bulk storage capacity will be constructed within 6.5 kilometers of another tank farm. Marine terminals listed in the table are used at ports or beaches and include the receiving tank farm and all facilities for offshore mooring of tankers and pumping petroleum products to the tank farm.

d. Pipeline Communications. A petroleum distribution system requires continuous communications between tank farm dispatchers, pump station operators, and pipeline patrol units. The Signal Corps provides both radio-voice and teletypewriter equipment for this communications system. Teletypewriter is used primarily for hourly recording of the flow of products along the pipeline and transmission of dispatching instructions between tank farms (para 3-6).

e. Pipeline Operations.

(1) *General.* Pipeline systems for distributing bulk petroleum fuels in the theater are operated by petroleum groups under the operational control of the TASCOT supply and maintenance command (SMCOM). Petroleum installations extend as far forward into the combat zone as possible. Liquid petroleum fuels can be moved most effectively and economically in bulk form. The distribution plan calls for maximum use of pipelines. Distribution of packaged petroleum fuels (5-gallon cans and 55-gallon drums) is restricted to the extent essential for adding flexibility to the system. Containers of POL smaller than 55-gallon drums are palletized when shipped to air terminals for subsequent air-landed delivery.

(2) *Supervisory and operating organizations.*

(a) *Supervisory.* The following organizations are supervisory:

1. Headquarters and headquarters de-

tachment, petroleum group (TOE 10-202). Normal requirements are one per military petroleum distribution system operated by two or more petroleum operating battalions and one per two to five separate military petroleum distribution systems, each operated by a petroleum operating battalion. May be assigned to field army or higher headquarters for petroleum logistic planning and coordination before the establishment of a COMMZ.

2. Headquarters and headquarters company, petroleum operating battalion (TOE 10-206). Normal requirement is one per petroleum port of entry.

(b) *Operating.* The petroleum operating company (TOE 10-207) operates four pump stations for a 6- or 8-inch multiproduct line on level terrain. This constitutes the operation of approximately 100 kilometers of pipeline. This company operates a tank farm on a 24-hour basis for storage of from 100,000 to 500,000 barrels of bulk petroleum. Complex consists of two tank farms each with a storage capacity of from 50,000 to 250,000 barrels.

7-14. Nuclear Powerplants

a. General.

(1) Nuclear powerplants operate for extended periods without refueling, thereby eliminating the need for a continuous fuel supply. Nuclear reactors can operate for from 1 to 2 years at full power between refueling.

(2) Another military advantage of nuclear powerplants is their capability to operate independently of combustion air, which makes them suitable for use in underground installations and hardened sites. The capability of nuclear powerplants to respond quickly to large load changes insures precise power over a wide range of load demands.

(3) Disadvantages of nuclear powerplants are the high initial cost, the requirements for protection against radiation hazards, and the special handling required to dispose of radioactive wastes.

(4) Military nuclear powerplants presently in use are pressurized water reactor systems. These systems consist basically of the primary loop and the secondary loop. The primary loop converts the heat generated from nuclear fission in the reactor to steam in the secondary loop through a tube-in-shell heat exchanger. The thermal energy is converted to mechanical energy by a Rankine-cycle steam turbine, which drives an electric generator. In a pressurized water reactor system, the primary loop water is maintained above saturation pressure to prevent boiling. An-

other type of reactor system that is widely in use by industry is the boiling water system. In this system, the reactor is maintained at saturation pressure, and the water is allowed to boil in the reactor vessel. The steam generated in the reactor is directed to the turbogenerator by natural circulation. The heat is rejected by a steam-condensing condenser, which is cooled by water taken from a river, lake, sea, or deep well. In arid areas, the heat is rejected by airblast coolers. The steam generated can also be used in space heating and desalination of sea or brackish water to provide potable water. Nuclear powerplants can be operated in environmental temperatures between -65° and $+100^{\circ}\text{F}$.

b. Station Powerplants. Permanent nuclear powerplants capable of electrical outputs of up to 2,000 kilowatts are presently in operation to provide steam and electricity to permanent camps and stations.

c. Portable Powerplants. Portable powerplants, also capable of producing electrical power up to 2,000 kilowatts, are the most readily adaptable to military requirements in remote areas. Prepackaged in the United States, these plants can be transported by air to any location in the world and set up for operation within 90 days after arrival on site. At the close of semipermanent operation, they can be relocated for use elsewhere.

d. Mobile Powerplants. A barge-mounted nuclear powerplant with electrical output of 10,000 kilowatts is operational. A floating powerplant, because of its mobility, is particularly attractive for military applications. To enable interconnection with most foreign or domestic systems, the generating system is designed for 50 and 60 cycles, with variable taps on the transformer to obtain the required voltages. Design studies have been completed for barge-mounted nuclear powerplants that have the capability of 50,000-kilowatt electrical output and a million and a half gallons of potable water. These highpowered barges can support coastal support bases accessible by a vessel of less than 20-foot draft. The power output from these floating powerplants can be transmitted to the shore by an aerial cable while the barge is moored at the pier or by submarine cables when it is anchored offshore.

e. Cost. The initial cost of a nuclear powerplant is relatively high when compared with a fossil-fuel steamplant or internal-combustion-engine powerplant. This high cost is due to the high standards under which the components are manufactured and the numerous safety features required to insure a reliable and safe operating plant. Nuclear powerplants are economically com-

petitive with other energy sources when the fuel cost is excessive because they are inaccessible; e.g., in remote sites or in underground facilities where extensive excavation is required for fuel storage.

f. Construction. Construction of a stationary plant takes no longer than that of a conventional plant of the same capacity. A portable plant can be designed, manufactured, and tested for installation in a remote site in 3 years. A barge-mounted nuclear powerplant can be built in 4 years.

g. Operators. Nuclear powerplant operators are a carefully selected group of career service enlisted men. Each nuclear powerman specializes as a maintenance technician in mechanical, electrical, or instrumentation areas or as a health physicist.

h. Maintenance. Maintenance requirements for standard power components are similar to those for other steam powerplants. However, because of the radiation hazard associated with the nuclear powerplants, the reactor must be shut down for maintenance on the nuclear system. As a result, when high reliability is essential, redundant systems are provided to permit maintenance during operation without affecting plant performance. The reactor also must be shut down periodically for refueling.

i. Health and Safety. Policies regulating Army nuclear reactor system health and safety procedures are in AR 385-80.

j. Summary. Nuclear power provides distinct logistic, operational, and, under certain applications, economic advantages over conventional systems in military applications. Although high initial cost is currently a deterrent to widespread use of nuclear power, technological advances continually reduce the initial investment and promise competitive status in the foreseeable future. In tactical situations where logistic considerations outweigh costs, there are definite advantages for the use of nuclear power. Only nuclear power can meet the demands for reliable and extended operation in underground installations, where operations must be independent of a continuous fuel supply or the earth's atmosphere.

7-15. Airfield Construction

a. Construction Effort Required for Airfields in a Theater of Operations. This paragraph is useful only for broad planning purposes. It provides estimates for computing engineer troop support required to construct U.S. Army and Air Force installations in oversea theaters. None of the factors in this section are suitable for the detailed planning required for construction of specific in-

Table 7-29. Army Airfield Construction Requirements

1	2	3	4	5	6	7	8	9
Type	Number of aircraft	Man-hours	Number of aircraft	Man-hours	Number of aircraft	Man-hours	Number of aircraft	Man-hours
<i>Hasty airfields—standard 4</i>								
2 Steel frame and pierced-steel plank.....	5	18,340	15	23,230	25	34,230	50	63,670
3 Steel frame and vinyl cloth.....		14,500		17,480		26,470		46,510
4 Wood frame and pierced-steel plank.....		18,909		24,070		35,070		64,940
5 Wood frame and vinyl cloth.....		15,150		18,320		27,310		47,780
<i>Deliberate airfields—standard 5</i>								
6 Steel frame.....	5	79,640	15	92,170	25	154,350	50	232,190
7 Wood frame.....		80,550		93,080		155,310		233,460

Table 7-30. Typical Minimum Area Requirements for Helicopters

1	2	3	4	5	6	7	8
Helipad or heliport type	Landing or parking pad (sq m)	Taxiway (sq m)	Runway (sq m)	Overrun (sq m)	Total traffic area ^a (sq m)	Total clear area ^b (sq m)	Dustproofing and/or waterproofing (area × sq m)
<i>Forward area helipad</i>							
2 OH-6A.....	13				13	467	1,809
3 UH-1D.....	36				36	900	3,164
4 CH-47.....	113				113	1,688	15,930
5 CH-54.....	225				225	2,025	11,610
<i>Forward area heliport</i>							
6 UH-1D company.....	900				900	28,179	33,597
7 CH-47 company.....	1,800				1,800	52,347	83,046
<i>Support area helipad</i>							
8 OH-6A.....	13				13	993	1,809
9 UH-1D.....	36				36	1,296	3,564
10 CH-47.....	113				113	2,025	15,930
11 CH-54.....	225				225	2,025	11,610
<i>Support area heliport</i>							
12 UH-1D company.....	900				900	40,959	44,523
13 CH-47 company.....	1,800	7,380	1,013	450	10,643	87,267	125,522
14 CH-54 company.....	1,800	8,202	2,025	900	12,036	56,284	75,465
15 Mixed battalion.....	10,839 ^d	8,342	1,013	450	20,643	181,996	179,460
<i>Rear area helipad</i>							
16 OH-6A.....	57				57	993	1,809
17 UH-1D.....	144				144	1,296	3,564
18 CH-47.....	450				450	2,025	15,930
19 CH-54.....	900				900	2,025	11,664
<i>Rear area heliport</i>							
20 UH-1D company.....	3,600				3,600	42,570	46,521
21 CH-47 company.....	7,200	11,313	1,620	720	20,133	92,250	116,787
22 CH-54 company.....	5,400	8,735	2,430	1,080	16,565	55,620	76,143
23 Mixed battalion.....	21,769 ^d	12,330	1,620	720	35,795	189,010	195,303

^a Traffic area includes parking or landing pad, taxiway, and runway.^b Total clear area is the area inside the lateral clearance line.^c This area includes the total clear area and an area around the perimeter, the width of which is determined by rotor downwash.^d Includes 7,200-sq m maintenance area.

stallations. Detailed planning data are contained in TM 5-330.

(1) *Army airfields.* Table 7-29, extracted from TM 5-301, shows the man-hours required to construct hasty airfields (standard 4) and deliberate airfields (standard 5).

(a) Standard 4 provides minimum facilities for operation and maintenance for a period of from 6 to 12 months. Concrete floors of 102-millimeter thickness are provided for maintenance and

supply and 51-millimeter thickness for other buildings.

(b) Standard 5 provides all-weather operational facilities for a period of more than 12 months. Concrete floors of 152-millimeter thickness are provided for hangars, 192-millimeter thickness for warehouse and cargo, and 51-millimeter thickness for other buildings.

(c) Both standards provide for takeoff, landing, servicing, fueling, and parking of fixed-

Table 7-31. *Battalion Months To Construct New Air Force Airfields*

1	2	3	4	5	6
Type of base	Critical aircraft	Runway minimum length	Emergency operational	Minimum operational	Full operational
2 Tactical (COMMZ).....	F-4C	2,440	-----	-----	-----
	F-105	-----	-----	-----	-----
3 One wing.....	-----	-----	6.5	10.0	14.5
4 One squadron.....	-----	-----	5.5	9.0	12.5
5 Heavy lift (COMMZ).....	C-141	3,050	-----	-----	-----
	C-124	-----	-----	-----	-----
6 One wing.....	-----	-----	10.0	12.5	17.0
7 One squadron.....	-----	-----	9.0	11.0	14.5
8 Medium lift (COMMZ).....	C-130	1,830	-----	-----	-----
9 One wing.....	-----	-----	3.0	6.5	14.0
10 One squadron.....	-----	-----	2.0	4.5	7.5
11 Troop carrier, assault (corps or FASCOM).....	C-7A	460	-----	-----	-----
12 One squadron.....	-----	-----	1.5	3.0	5.5

and rotary-wing aircraft and for all accommodations in buildings.

(2) *Heliports.* Table 7-30 lists area requirements for helipads and heliports by various aircraft and type of facility.

(3) *Air Force airfields.* Table 7-31 gives the average number of engineer CB months required to accomplish emergency, minimum, and full operational construction of different types of bases. A factor of 75 percent of total construction of a new base can be used to estimate the average construction required to reconstruct an existing base or to use a site where an airfield of some type exists or has existed. The battalion-months in the table are not applicable to extreme climatic conditions and mountainous or swampy terrain. Critical aircraft (col 2) are those aircraft that require the longest runway in each category.

(4) *Battalion-month estimates.* The number of engineer CB months to construct the different type of bases is calculated from the man- and equipment-hour workload needed to build each base. This is determined by specifying for each type of base the kinds and numbers of facilities required for the performance of the function of the units supported by the base, i.e., Airways and Air Communications Service (AACS) station, housing, and runway. Each of these facilities is broken down into the kinds and numbers of elements composing it, i.e., paved surfaces, shops, messhalls, and latrines. A man- and equipment-hour factor, such as 1.75 hours per square meter of paved surface, is then applied to each of these elements to compute the total man-hours required to construct each element. The number of hours for all elements are added to give the total man- and equipment-hours required to construct the base. This total is converted to CB months by using the factor 125,000 man- and equipment-

hours of construction effort as equivalent to 1 engineer CB month.

b. *Conversion of Battalion-Months of Effort to Engineer CB.* To compute manning, training, and equipping requirements, it is necessary to convert engineer CB months as given above to the number of CB required. Thus, a construction task requiring 8 engineer CB months can be accomplished by one engineer CB working for 8 months, two CB working for 4 months, or four CB working for 2 months. In emergencies, immediate and urgent requirements may develop for the construction of complex installations, e.g., a heavy bomber base. Theoretically, this could be done by concentrating enough CB in the area to perform the required number of months of construction. However, the effect of oversaturation is involved in that the efficiency of the work diminishes as the personnel, equipment, and supplies of the different CB create interference. On the basis of these saturation considerations, table 7-32 presents estimates of the number of engineer CB that can be used most efficiently.

Table 7-32. *Engineer CB Employment Utilization*

1	2
Battalion months of construction effort required	Optimum number of battalions best employed
2 25-35.....	4
3 15-24.....	3
4 5-14.....	2
5 Fewer than 5.....	1

7-16. Signal Construction Factors

a. *Estimated Time Required for Linework Operations.* The time factors listed in table 7-33 are maximum for any operation. However, buried construction does not cover operations in jungle, arctic or desert areas. In ground surface con-

Table 7-33. Estimated Time Required for Linework Operations

1	1 Operation	2 Man-hours placing	3 Man-hours removing
	Laying out and staking line open wire:		
2	150-m span—km	5.50	.....
	Material distribution:		
3	Lightweight metal poles—each	0.30	.....
4	Round wooden poles—each	0.50	.....
5	Wire and accessory materials, 150-m span—4 pr—km	2.30	.....
6	Insulated wire and accessory materials—150-m span—km	1.30	.....
7	PVC cable and accessory materials—per reel	1.80	.....
	Holes—pole:		
8	Dug by hand—per hole	2.00	.....
9	Dug by machine—per hole	0.50	.....
10	Dug by blasting, hand drilling—per hole	5.00	.....
	Holes—anchor:		
11	Dug by hand—4 by 4 log—each	3.00	.....
12	Dug by machine—log or plank—each	0.70	.....
13	Dug by machine—patent—each	0.80	.....
14	Dug by hand— $\frac{5}{8}$ -in. rock—each	3.00	.....
	Assembling hardware and placing crossarm—open wire:		
15	Lightweight metal—four pins—each	0.30	0.20
16	Round wooden poles—eight pins—each	0.50	0.20
	Setting poles (erecting, backfilling, and tamping):		
17	Lightweight metal—each	0.40	0.30
18	20-ft round—each	1.50	1.00
19	30-ft round—each	2.00	1.20
	Guying:		
	Placing anchor and backfilling:		
20	Lightweight metal poles—each	0.60	.....
21	Round pole log or plank—each	1.80	.....
22	Patent—each	1.00	.....
	Placing and tensioning guying:		
23	W-145, 109 GS, or similar—each	0.80	0.40
24	Wire messenger, 2.2M—each	1.50	0.40
25	Wire messenger, 6M or 10M—each	1.50	0.80
	Installing line wire (placing, sagging, and tying in):		
26	One pr—km	15.50	8.10
27	Four pr—km	25.00	11.20
	Placing PVF-covered cable on messenger:		
28	11 to 101 pr—km	78.00	50.00
29	More than 101 pr—km	102.00	72.00
30	Placing insulated wire on existing pole line—km	7.40	4.40
	Ground surface construction:		
31	Spiral-4—km	1.60	1.60
32	Wire, WD-1TT, or similar—km	0.95	0.62
	Buried construction (using cable plow, LC-236()/MT):		
	Spiral-4:		
33	One cable—km	5.30	1.90
34	Two cables, same trench—km	6.20	2.50
35	Jute-covered, tape—armored—km	28.10	42.00
36	Constructing overhead crossing for insulated wire—each	5.20	.....

struction operations (lines 31 and 32), add 7.4 man-hours per kilometer for spiral-4 and 3.7 man-hours per kilometer for wire, WD-1/TT, to cover surveying, staking line, testing sections, and policing.

b. Characteristics of Round Telephone Poles. In table 7-34 the northern and western cedars indicated are butt treated; pine is treated full

length. (Requirements at 6 feet from the butt are not shown.) An estimate of the shipping space required for poles is —

$$\frac{\text{Average weight (pounds)} \times \text{constant}}{40} = \text{measurement tons}$$

Values of the constant are—

Cedars = 0.052

Pine = 0.026

Table 7-34. Characteristics of Round Telephone Poles (American Standard)

1	Class	1	2	3	4	5	6	7
2	Minimum top circumference (in).....	27	25	23	21	19	17	15
3	Transverse breaking loads (lb).....	4,500	3,700	3,000	2,400	1,900	1,500	1,200
	Type	Length (ft)	Approximate average weight (lb)					
4	Western cedar.....	20	700	600	500	400	300	225
5	Northern cedar.....	20	720	600	540	350	300	230
6	Creosoted pine.....	20	635	555	479	418	353	310
7	Western cedar.....	25	850	720	600	480	400	320
8	Northern cedar.....	25	1,020	780	600	515	420	300
9	Creosoted pine.....	25	898	808	686	602	508	423
10	Western cedar.....	30	1,000	850	730	610	500	420
11	Northern cedar.....	30	1,320	1,170	870	630	520	420
12	Creosoted pine.....	30	1,241	1,076	921	780	672	573
13	Western cedar.....	35	1,200	1,000	850	750	650	560
14	Northern cedar.....	35	1,620	1,380	1,060	820	720	510
15	Creosoted pine.....	35	1,603	1,410	1,213	996	865	733

c. *Telephone Operational Data.* Telephone operational data are included in (1) through (4) below. Space requirements are included in table 7-35.

(1) *Commercial-type telephone switchboard capacity — position comparison.*

Toll switchboard capacity—lines	Positions
100.....	15
200.....	25
300.....	34
400.....	40

(2) *Local (common battery manual) call handling time and traffic distribution.*

(a) *Call handling time.*

One operator handles 150 calls per operator-hour

Two operators handle 200 calls per operator-hour

Three operators handle 220 calls per operator-hour

Four operators handle 225 calls per operator-hour

Five operators handle 230 calls per operator-hour

(b) *Distribution of traffic (average situation).*

	Percentage
Local calls.....	40
Outgoing trunk calls.....	30
Incoming trunk calls.....	30

(3) *Toll (common battery manual) call handling time and traffic distribution.*

(a) *Call handling time.*

One operator handles 20 calls per operator-hour

Two operators handle 25 calls per operator-hour

Three operators handle 30 calls per operator-hour

Four operators handle 35 calls per operator-hour

Five operators handle 40 calls per operator-hour

(b) *Distribution of traffic (average situation).*

	Percentage
Outward.....	55
Inward.....	30
Through (switchboard).....	15

(4) *Normal telephone instrument requirements (combat units).*

(a) One per general officer.

(b) One per two field grade officers.

(c) One per four company grade officers.

(d) One per 50 or 100 enlisted men, depending on whether troop basis is on TOE basis or personnel are operating as part of a large headquarters staff.

(e) One per 50 or 100 square feet of office space.

Table 7-35. Space Requirements—Communication Facilities
a. Common Battery Manual Telephone Switchboard (Fixed Plant)

1	2	3
Line capacity	Switchboard positions	Space requirements (sq m)
2	100	42
3	100	49
4	200	55
5	200	70
6	400	130
7	600	160
8	800	172
9	1,000	195
10	1,200	212
11	1,600	294
12	2,000	294
13	2,800	396
14	3,600	498

Table 7-35—Continued
b. Dial Central Office

1	2		3	4
	Line capacity		Approximate space requirements	
	Initial	Expandable to—	Dimensions (m)	(Area (sq m))
2	200	400	9.2 by 16.7	153
3	400	600	9.7 by 16.7	193
4	600	1,000	10.7 by 21.3	228
5	1,000	1,400	10.7 by 25.0	266
6	1,400	2,000	12.2 by 29.0	353
7	2,000	3,000	13.7 by 33.5	460
8	3,000	4,800	14.9 by 36.3	540

c. Fixed Communications Center

1	2	Space requirements (sq m)
	Size	
2	Small	88
3	Medium	177
4	Large	280

d. Fixed Radio Transmitter Station

1	2	3
	Size	Space requirements (sq m)
2	Small	Up to 280.
3	Medium	280 to 1,200.
4	Large	1,200 and up.

Table 7-35—Continued
e. Fixed Radio Receiver Station

1	2	3
	Size	Space requirements (sq m)
2	Small	Up to 370.
3	Medium	370 to 740.
4	Large	740 and up.

f. Antenna Field*

1	2	3
	Type	Space requirements (M sq m)
Transmitter:		
2	Small (5 to 7 antennas)	60 to 100.
3	Medium (15 antennas)	180 to 300.
4	Large (25 to 35 antennas)	400 to 1,600.
Receiver:		
5	Small (8 antennas)	140 to 200.
6	Medium (25 to 30 antennas)	800 to 1,200.
7	Large (50 to 60 antennas)	1,800 to 2,400.

*Space is based on average conditions existing. However, space requirements may vary, depending on type of antennas, equipment used, location, and terrain.

Section III. OTHER COMBAT SERVICE SUPPORT

7-17. General

a. Water purification is a part of the GS of the army combat engineer brigade through the engineer combat battalion (TOE 5-35). Where water sources are available, this unit can purify up to 120,000 gallons of water per day.

b. The army engineer combat brigade will decide the establishment of any temporary installation for the support of engineer construction efforts.

c. Engineer cellular units (TOE 5-500 series) provide utilities, fire protection, and real estate support.

7-18. Water Supply

Tables 7-36 through 7-39 provide data on water requirements in the field army and the equipment used to meet the requirements.

Table 7-36. Water Requirements

Table 7-56. Water Requirements						
1	2	3	4	5		
1	Unit consumer	Conditions of use	Gallons per unit consumer per day		Remarks	
			Temperate/cold climate	Desert/jungle		
2	Man.....	In combat:				
		Minimum.....	1/2-1	2-3	For eating and drinking only; periods not to exceed 3 days.	
			2	3-4	When field rations are used.	
		Normal.....	3	6	Drinking plus small amount for cooking or personal hygiene.	
		March or bivouac.....	2	5	Minimum for all purposes.	
		Temporary camp.....	5		Desirable for all purposes (does not include bathing).	
		Temporary camp with bathing facilities.....	15		Includes allowance for waterborne sewerage system.	
		Semipermanent camp.....	30-60			
		Permanent camp.....	60-100			
3	Vehicle.....	Level and rolling country.....	1/8- 1/2		Depending on size of vehicle.	
		Mountainous country.....	1/4-1		Depending on size of vehicle.	
4	Locomotive.....	Standard military.....	Variable		95 gallons per train-kilometer.	
		Commercial.....	Variable		125 gallons per train-kilometer.	
5	Hospital.....	Standard 2.....	50 per bed		Includes water for medical personnel; sewage not waterborne.	
		Standards 3, 4, 6.....	85 per bed		Includes water for medical personnel and for waterborne sewage.	
6	Impregnating plant, clothing.....	Maximum impregnating capacity.....	2,400		Aqueous process. Includes 2,000 gallons for washing and cleaning purposes.	
7	Bakery section.....	Two 10-hour shifts.....	1,400		Water for making bread and cleaning baking utensils.	
8	Laundry unit.....	Two 10-hour shifts.....	4,000			
9	Shower unit.....		9,800			
10	Decontaminating apparatus, 400-gallon, truck-mounted.....	Decontamination.....	4,000		Water obtained from natural source when available.	
11	Chemical base laboratory, M2.....	Normal laboratory work.....	300			

Table 7-37. Water Equipment Issued to Engineer Units

1		2	3	4	5	6		7	8	9	10	11	12
1	Unit	TOE	Number of sets ¹	Type of purification unit (fresh water) (gph)	Gener-ator (kw)	Equipment in each set		Pump discharge (gpm per set) ²		Total storage capacity (gal)	Maximum production (gph)	Water transport equip	
						Tank		Distribu-tion	Purifica-tion				
						Num-ber	Capacity (gal)						
2	Engr bn, abn div	5-25G	5	600	3	2	1,000	65	10	5,000	3,000	.....	
3	Engr cbt bn, army or corps	5-35G	5	1,600	10	2	6,000	125	25	30,000	7,500	.....	
4	Engr WS co	5-67G	9	3,000 (mbl)	10	2	6,000	125	50	54,000	27,000	12 1,000-gal tk trk.	
5	Engr co, sep inf bde	5-107G	2	1,500	10	2	6,000	125	25	12,000	3,000	HEA 2000 gal semi TRLR.	
6	Engr CB	5-115G	2	1,500	10	2	6,000	125	25	12,000	3,000	.....	
7	Engr co, sep armd or inf (mech) bde	5-127G	2	1,500	10	2	6,000	125	25	12,000	3,000	.....	
8	Engr co, sep abn bde	5-137G	1	600	3	2	1,000	65	10	1,000	600	.....	
9	Engr bn, armd and inf (mech) div	5-145G	5	1,500	10	2	6,000	125	25	30,000	7,500	.....	
10	Engr bn, inf div	5-155G	5	1,500	10	2	6,000	125	25	30,000	7,500	.....	
11	Engr cbt bn, abn	5-195G	3	600 (mbl)							1,800	.....	
12	Engr co, sep lt inf bde	5-207G	2	1,500 (mbl)							3,000	.....	
13	Engr bn, airmbl div	5-215T	5	500 (mb)							2,500	.....	
14	Well-drilling tm, abn (GF)	5-520G	1	Well-drilling set. ....								.....	
15	Water purification tm (CG)	5-520G	1	3,000 (base)	10	3	3,000	125	50	9,000	3,000	.....	
16	Water purification tm (GH)	5-520G	4	3,000 (base)	10	12	3,000	125	50	3,000	12,000	.....	
17	Water trans tm (GJ)	5-520G		.....								5 1,000-gal tk trk.	
18	Water distillation tm (GI)	5-520G	1	6,000							6,000	.....	

¹ Each set can equip one water point.² One pump at steady purification rate; others at full-rated capacity for distribution (intermittent operation).

Table 7-38. Water Distribution Equipment

1	2	3
Line item number	Equipment	Capacity
S73120	Stlr, tk, water, 2-wheel:	
2	With 2 1/2-ton trk, trac.....	2,000 gal
3	With unit ki.....	5-gal cans, wt 50 lb (filled)
4	S73257 Stlr, tk, potable water, 4-2h331, forced disch.....	5,000 gal
5	W95811 Tlr, cgo, 1 1/2-ton, 2-wheel.....	60 cans filled
6	W98962 Tlr, tk, water, 2-wheel.....	400 gal
7	X40009 Trk, cgo, 2 1/2-ton, 6x6.....	100 cans filled
8	X58367 Trk, tk, water, 2 1/2-ton, 6x6.....	1,000 gal

Table 7-39. Capacities of Other Water Supply Equipment

1	2	3
Line item number	Equipment	Capacity
2	G58426 Drill, mach, well, rot.....	4 7/8-in.-diam well at 600 ft.
3	G58563 Drill, mach, percussion.....	6-in.-diam well at 1,000 ft.
4	G58597 Drill, mach, well.....	5 7/8-in.-diam well at 1,500 ft.
5	P91756 Pump, cntrf, 1 1/2-in. suction and disch.....	65 gpm at 50-ft head.
6	P92167 Pump, cntrf, 2-in. suction and disch.....	170 gpm at 50-ft head.
7	P92578 Pump, cntrf, 3-in. suction and disch.....	240 gpm at 60-ft head.
8	P92989 Pump, cntrf, 4-in. suction and disch.....	200 gpm at 300-ft head.
9	P93400 Pump, cntrf, 6-in. suction and disch.....	500 gpm at 555-ft head; 1,400 gpm at 275-ft head.
10	P96503 Pumping assy, deep-well.....	50 gpm against 250-ft head.
11	P96914 Pumping assy, 4-in.....	200 gpm against 200-ft head.

7-19. Printing Rates

Table 7-40 provides subject data.

Table 7-40. Printing Rates

1	2	3
Duplicating method	Number of copies	Copies per minute
2 Stencil.....	10,000	90-180
3 Multigraph.....	Unlimited	100
4 Multilith (paper master).....	300-1,000	100
5 Multilith (metal master).....	10,000	100
6 Photo-offset.....	Unlimited	150
7 Heavy press.....	Unlimited	600

7-20. Training Areas and Facilities

a. Corps Training Area Requirements. A maneuver area of approximately 4 million acres is required for a corps field training exercise involving three divisions and a normal corps slice of combat, combat support, and combat service support units. An impact area of 15,000 acres should be available in or adjacent to the maneuver area to accommodate live-firing exercises.

b. Division Training Area Requirements. Current doctrine on the employment of divisions in both nuclear and nonnuclear warfare increases the requirements for training areas in size and for variety in types of terrain, cover, and concealment. The increased versatility and range of infantry, armor, and artillery weapons; the increased use of aircraft for the mobility of divisional units; and the requirements for greater

dispersion of units in a tactical area have outmoded previous concepts of both field exercise areas and firing and impact areas. Consequently, installations that have previously been used for the training of divisions are no longer capable of meeting present-day requirements.

(1) *Division cantonment areas.* The division cantonment area should be near the perimeter of the land available and accessible to highways and railroad facilities. The area should provide all housing, storage, railroad yards, administration, shops, close-in training areas, miscellaneous training courses, a landing field, station hospital, division review field of at least 220 by 1,400 meters, and recreational facilities. For a functional layout of division camps, see drawing numbers E-16-06-21 and E-16-06-22, obtainable from Office, Chief of Engineers. See also appropriate AR 210-series.

(2) *Division field exercise area.* The field exercise area includes all available land except that used for cantonment, miscellaneous activities, and the firing and impact area. Portions of the firing and impact area not in use during the exercises may serve as a field exercise area. This area should contain streams or lakes for training in construction of fixed and floating bridges. Landing strips for organic aircraft should be at several places in the field exercise area. The area for an airborne division should contain several cleared areas suitable for use as drop zones and landing zones and should be within 1 day's march

of an airfield suitable for use by Air Force aircraft.

(3) *Division firing and impact area.* The firing and impact area should permit firing all ranges simultaneously. A suggested layout is contained in AR 210-21. AR 385-63 lists safety requirements. This area should be of varied terrain with suitable locations for ground observation points. The impact area may be submarginal or swampland.

c. Average Installation Area Requirements. The subparagraphs below are pertinent to the data included in table 7-41, which lists the average installation area requirements for various types of units.

(1) Division strengths include nondivisional and supporting troops, i.e., aggregate strength. Corps strength includes corps troops plus one-third of normal field army engineer and field army air defense artillery (ADA) units.

(2) ADA firing center troops, cantonment, and miscellaneous activities support three automatic weapon battalions. These three battalions require position areas and danger areas for simultaneous firing through 45° safety angle. However, the danger area may be sited over water. AR 385-62 lists range safety requirements for missiles and AR 385-63 lists them for guns.

(3) Tank firing center troops, cantonment, and miscellaneous activities support three tank battalions and proportionate station overhead.

d. Area Factors — Nondivisional Units. Site area factors for troop camps, administrative facilities, hospitals, PW camps, unclassified storage, and miscellaneous buildings are listed in table 7-23.

7-21. General

a. Definition. Base development is the acquisition, development, improvement, and expansion or rehabilitation of the facilities and resources of an area or location for the support of forces employed in military operations or deployed in accordance with strategic plans.

b. Phases of Base Development.

(1) *Planning phase.* Because of the long leadtime needed to assemble men and materiel, planning for base development must be begun as early as possible to support any operation. Guidance for base development planning is contained in the base development study and the base development planning directive and culminates in the base development plan. During this phase, the requirements for personnel and materiel are developed and submitted to appropriate agencies.

(2) *Execution phase.* The execution phase starts with the coordinated arrival of personnel and materiel in the objective area. During this phase, construction begins. Changes in tactical operation plans or the mission, or the receipt of new information on existing facilities and resources can change priorities, standards of construction, and facilities to be constructed. All changes to the plan must be made rapidly and forwarded to the field to insure maximum efficient use of men and materiel.

7-22. Base Development Planning

a. General. FM 100-10 provides the general aspects of base development planning, including responsibilities, planning considerations, the planning directive, elements of base development plans, and a sample format for a base development plan.

b. Logistic Data for Base Development. Data throughout this manual apply to the execution phase of base development and to site and area factors. Data pertaining to major base development tasks follow:

(1) Storage — paragraphs 5-27 through 5-36.

(2) Hospital bed requirements — paragraphs 4-18 through 4-20.

(3) Transportation — chapter 6.

(4) Construction — paragraphs 7-7 through 7-16.

(5) Communications — paragraphs 3-1 through 3-8.

Table 7-41. Data on Installation Areas in Approximate Acreages

1	2	3	4	5	6	7
Typical units	Approximate number of troops	Cantonment area (acres)	Miscellaneous activities area (acres)	Field exercise area (acres)	Firing and impact area (acres)	Total (acres)
2 Inf div.....	30,000	2,200	1,000	50,000	140,000	193,200
3 Inf div (mech).....	30,000	2,200	1,000	70,000	140,000	213,200
4 Armd div.....	30,000	2,200	1,000	70,000	140,000	213,200
5 Abn div.....	30,000	2,200	1,000	50,000	90,000	143,200
6 Corps trps.....	30,000	2,400	1,000	10,000	40,000	53,400
7 ADA firing cen.....	2,500	250	150	6,000	70,000	76,400
8 Tk firing cen.....	2,500	250	150	Not required	140,000	140,400

APPENDIX A

REFERENCES

A-1. Army Regulations

(S) AR 11-12 Supply Priorities (U).
 AR 117-5 Military Mapping and Geodesy.
 AR 210-21 Training Areas and Facilities for Ground Troops.
 AR 220-10 Preparation for Oversea Movement of Units (POM).
 AR 230-1 Nonappropriated Funds and Related Activities.
 AR 310-25 Dictionary of United States Army Terms (AD).
 AR 385-62 Firing Guided Missiles and Heavy Rockets for Training, Target Practice, and Combat.
 AR 385-63 Regulations for Firing Ammunition for Training, Target Practice, and Combat.
 AR 385-80 Nuclear Reactor Health and Safety.
 AR 701-5 Materiel Management Responsibilities Federal Supply Classification (FSC) Class Assignments.
 AR 711-16 DSU/Installation Stock Control and Supply Procedures.

A-2. Department of the Army Pamphlets

DA Pam 310-series

A-3. Field Manuals

FM 5-1 Engineer Troop Organizations and Operations.
 FM 5-15 Field Fortifications.
 FM 5-25 Explosives and Demolitions.
 FM 5-34 Engineer Field Data.
 FM 5-36 Route Reconnaissance and Classification.
 FM 5-144 Engineer Amphibious Units.
 FM 8-55 Army Medical Service Planning Guide.
 FM 9-6 Ammunition Service in the Theater of Operations.
 FM 10-13 Supply and Service Reference Data.
 FM 10-60 Supply and Subsistence in a Theater of Operations.
 FM 20-15 Pole and Frame Supported Tents.
 FM 20-16 Air-Supported Tentage.
 FM 20-32 Landmine Warfare.
 FM 24-19 Communications-Electronics Reference Data.
 FM 30-5 Combat Intelligence.
 (S) FM 30-9A Military Intelligence Battalion, Field Army (U).
 FM 31-21 Special Forces Operations.
 (S) FM 31-21A Special Forces Operations (U).
 FM 31-22 U.S. Army Counterinsurgency Forces.
 FM 41-10 Civil Affairs Operations.
 (S) FM 44-1A U.S. Army Air Defense Artillery Employment (U).
 (S) FM 44-96A Air Defense Artillery Employment, HAWK (U).
 FM 54-8 The Administrative Support, Theater Army (TASTA-70).

FM 55-15
 FM 55-20
 FM 55-30
 FM 55-51

FM 55-52

FM 55-56

FM 55-57

FM 55-58
 FM 57-1

FM 57-35
 FM 60-30

FM 61-100
 FM 100-5

FM 100-10
 FM 100-27

FM 101-5

FM 101-10-2

(S) FM 101-10-3

(C) FM 101-20

(S) FM 101-31-2

Transportation Reference Data.
 Army Rail Transport Operations.
 Army Motor Transport Operations.
 Transportation Terminal Commands Theater of Operations.
 Transportation Terminal Battalion and Terminal Service Company.
 Transportation Terminal Transfer Company.
 Transportation Harbor Craft Units and Marine Maintenance Units.
 Transportation Boat Operations.
 U.S. Army/U.S. Air Force Doctrine for Airborne Operations.
 Airmobile Operations.
 Embarkation and Loading—Amphibious.
 The Division.
 Operations of Army Forces in the Field.
 Combat Service Support.
 U.S. Army/U.S. Air Force Doctrine for Tactical Airlift Operations.
 Staff Officers' Field Manual: Staff Organization and Procedure.
 Staff Officers' Field Manual: Organizational, Technical, and Logistical Data Extracts of Organization and Equipment.
 Staff Officers' Field Manual: Organizational, Technical, and Logistical Data. Classified Data (U).
 United States Army Aviation Planning Manual (U).
 Staff Officers' Field Manual: Nuclear Weapons Employment Effects Data (U).

A-4. Navy Documents

NAVDOK T-401 Pontoon Gear Handbook.

A-5. Supply Bulletins

SB 1-1 Army Aircraft Flying Hour Factors and Forecast.
 (C) SB 38-26 Ammunition Supply Rates (U).
 SB 700-20 Adopted Items of Material and Army Reportable Items.

A-6. Technical Bulletins

TB 55-46 Standard Characteristics (Dimensions, Weight, and Cube) for Transportability of Military Vehicles and Equipment.

A-7. Technical Manuals

TM 5-236 Surveying Tables and Graphs.
 TM 5-301 Staff Tables of Engineer Functional Components System.
 TM 5-302 Construction in the Theater of Operations.
 TM 5-312 Military Fixed Bridges.

FM 101-10-1

TM 5-330	Planning and Design of Roads, Air-bases, and Heliports in the Theater of Operations.	TM 10-1100-series	Destruction of Ammunition. Petroleum Pipeline and Terminal Operating Procedures and Techniques (as appropriate).
TM 5-343	Military Petroleum Pipeline Systems.	TM 55-450-15	Air Movement of Troops and Equipment.
TM 5-373	Through Truss Railway Bridges.	TM 743-200	Storage and Materials Handling.
TM 9-500	Data Sheets for Ordnance Type Materiel.	TM 55-206	Railway Train Operation.
TM 9-1300-206	Care, Handling, Preservation, and		

APPENDIX B

SUPPLY DATA BASED ON WORLD WAR II

The data in this appendix represent World War II experience. They provide a picture of a large landmass army (or a portion of a large army in a specific theater) conventional conflict, under the supply system of five classes and the technical services. They are reproduced from FM 101-10, dated August 1949.

Table B-1. *European Theater*¹

1	Item	2 Lb per man per day	3 Tons per man per mo	4 Conver- sion factor STON to MTON ²	5 MTON per man per mo	6 MTON per man per mo with 15-per- cent stowage factor
2	CI I-rat.....	7.170	0.108	2.1	0.227	0.261
	CI II:					
3	QM clo and equipage.....	0.426	0.006	2.0	0.012	0.014
4	QM gen sup.....	0.305	0.005	2.8	0.014	0.016
5	Ord gen sup.....	0.620	0.009	2.2	0.020	0.023
6	Engr.....	0.630	0.009	3.3	0.030	0.035
	Ord.....	2.710	0.041	1.8	0.074	0.085
8	Cml (incl cl IV).....	0.025	0.001	2.3	0.002	0.002
9	Sig (incl cl IV).....	0.725	0.011	3.8	0.024	0.048
10	Med (incl cl IV).....	0.300	0.005	2.5	0.013	0.015
11	Total cl II.....	5.740	0.087		0.207	0.238
	CI III:					
12	Gas, oil, grease ³ (less AF).....	11.400	0.171	1.5	0.257	0.296
13	AF fuel and lubs ⁴	13.400	0.201	1.5	0.302	0.347
14	Subtotal ⁵	24.800	0.372		0.559	0.643
15	Fuel for Temperate Zone.....	8.500	0.128	2.0	0.256	0.294
16	Total cl III.....	33.300	0.500		0.815	0.937
	CI IV:					
17	Med (incl cl II).....					
18	Ord mtr maint.....	0.510	0.008	1.0	0.008	0.009
19	QM sales items.....	2.000	0.030	1.7	0.051	0.059
20	AF sup and repl.....	2.840	0.043	4.0	0.172	0.198
21	Engr const mat.....	7.280	0.109	1.5	0.164	0.189
22	Sig (incl cl II).....					
23	Cml.....	Negligible				
24	Trans.....	Negligible				
25	Total cl IV.....	12.600	0.190		0.395	0.455
	CI V:					
26	Ammo (less AF).....	3.640	0.055	0.9	0.050	0.058
27	AF ammo.....	4.410	0.066	0.9	0.059	0.068
28	Total cl V.....	8.050	0.121		0.109	0.126
29	Total European Theater.....	66.800	1.010		1.750	2.020

¹ Nongas conditions.² Conversion factors are based on average cubage for each item. MTON (40 cu ft) of any one item can be found by multiplying its STON (2,000 lb) weight by that item's conversion factor.³ Consists of the following:

- 90 percent gasoline
- 4 percent diesel fuel
- 3 percent engine oil
- 1 percent gear lubricant
- 2 percent greases

⁴ CI IIIA.⁵ Assume 90 percent of quantities shown in this line is shipped by tanker and 10 percent is shipped in packaged containers as dry cargo.

Table B-2. Pacific Theater¹

1	2	3	4	5	6
Item	Lb per man per day	Tons per man per mo	Conversion factor STON to MTON ²	MTON per man per mo	MTON per man per mo with 15-percent stowage factor
2 CI I-rat.....	6.710	0.101	2.1	0.212	0.244
CI II:					
3 QM clo and equipage.....	1.000	0.015	2.0	0.030	0.035
4 QM gen sup.....	0.730	0.011	2.8	0.031	0.036
5 Ord veh repl.....	0.620	0.009	2.2	0.020	0.023
6 Engr.....	0.370	0.006	3.3	0.020	0.023
7 Ord.....	0.300	0.005	1.8	0.009	0.010
8 Cml (incl cl IV).....	0.567	0.009	2.3	0.021	0.024
9 Sig (incl cl IV).....	0.750	0.011	3.8	0.042	0.048
10 Med (incl cl I & IV).....	0.330	0.005	2.5	0.013	0.015
11 Total cl II.....	4.670	0.071	-----	0.186	0.214
CI III:					
12 Gas, oil, grease ³ (less AF).....	10.800	0.162	1.5	0.243	0.279
13 AF fuel and lubs ⁴	11.080	0.166	1.5	0.249	0.286
14 Subtotal ⁵	21.900	0.328	-----	0.492	0.565
15 Fuel for Temperate Zone.....	8.500	0.128	2.0	0.256	0.294
16 Total cl III.....	30.400	0.456	-----	0.748	0.859
CI IV:					
17 Med (incl in class II).....					
18 Ord mtr maint.....	0.180	0.003	1.0	0.003	0.003
19 QM sales items.....	1.970	0.030	1.7	0.051	0.059
20 AF sup and repl.....	2.840	0.043	4.0	0.172	0.198
21 Engr const mat.....	11.900	0.179	1.5	0.268	0.308
22 Sig (incl in cl II).....					
23 Cml (incl in cl II).....					
24 Trans.....	0.130	0.002	2.4	0.005	0.006
25 Total cl IV.....	17.000	0.257	-----	0.499	0.574
CI V:					
26 Ammo (less AF).....	5.140	0.077	0.9	0.070	0.081
27 AF ammo.....	3.470	0.052	0.9	0.047	0.054
28 Total cl V.....	8.610	0.129	-----	0.117	0.135
29 Total Pacific Theater.....	67.4	1.010	-----	1.760	2.030

¹ Nongas conditions.² Conversion factors are based on average cubage for each item. MTON (40 cu ft) of any one item can be found by multiplying its STON (2,000 lb) weight by that item's conversion factor.³ Consists of following:

- 63 percent gasoline
- 31 percent diesel fuel
- 3 percent engine oil
- 1 percent gear lubricant
- 2 percent greases

⁴ Class IIIA.⁵ Assume that 90 percent of quantity shown in this line is shipped by tanker and 10 percent is shipped in packaged containers as dry cargo.

Table B-3. Polar Regions¹

1	2	3	4	5	6
Item	Lb per man per day	Tons per man per mo	Conversion factor STON to MTON ²	MTON per man per mo	MTON per man per mo with 15-percent stowage factor
2 Cl I-rat.....	10.40	0.156	2.1	0.328	0.377
Cl II:					
3 QM clo and equipage.....	0.85	0.013	2.9	0.038	0.044
4 QM gen sup.....	0.40	0.006	2.8	0.017	0.020
5 Ord veh repl.....	0.62	0.009	2.2	0.020	0.023
6 Engr.....	0.84	0.013	3.3	0.043	0.049
7 Ord.....	2.00	0.030	1.8	0.054	0.062
8 Cml (incl cl IV).....	0.03	Negligible	2.3	0.001	0.001
9 Sig (incl cl IV).....	0.66	0.010	3.8	0.038	0.044
10 Med (incl cl I & IV).....	0.40	0.006	2.5	0.015	0.017
11 Total cl II.....	5.80	0.087	-----	0.226	0.260
Cl III:					
12 Gas, oil, grease, compounds.....	9.00	0.135	1.5	0.203	0.233
13 AF fuel and lubs ³	14.00	0.210	1.5	0.315	0.362
14 Fuel, solid.....	18.50	0.277	2.0	0.555	0.638
15 Total cl III.....	41.50	0.622	-----	1.073	1.233
Cl IV:					
16 Med (incl in cl II).....					
17 Ord mtr maint.....	0.5	0.008	1.0	0.008	0.009
18 QM sales items.....	2.0	0.030	1.7	0.051	0.059
19 AF sup and repl ⁴	3.5	0.052	4.0	0.208	0.239
20 Engr const mat.....	12.0	0.180	1.5	0.270	0.310
21 Sig (incl in cl II).....					
22 Cm (incl in cl II).....					
23 Total cl IV.....	18.0	0.270	-----	0.537	0.618
Cl V:					
24 Ammo.....	1.9	0.027	0.9	0.024	0.028
25 AF ammo ⁵	3.5	0.052	0.9	0.047	0.054
26 Total cl V.....	5.3	0.079	-----	0.071	0.082
27 Total.....	81.0	1.22	-----	2.24	2.58

¹ Estimated, based on arctic test operations.² Conversion factors are based on average cubage for each item. Ship tons (40 cu ft) of any one item can be found by multiplying its STON (2,000 lb) weight by that item's conversion factor.³ Class IIIA.⁴ Class IIA and IVA.⁵ Class VA.

Table B-4. Combat Zone and Communications Zone

1	Item	Lb per man per day		
		2 Per Army man in CZ, continental landmass ¹	3 Per Army man in CZ, jungle ²	4 Per Army man in COMMZ ³
2	Cl I.....	7.69	5.95	8.80
	Cl II and IV:			
3	Air.....	0.023	0.016	Negligible
4	Cml.....	0.040	0.090	0.030
5	Engr.....	2.49	8.95	13.2
6	Med.....	0.112	0.560	1.11
7	Ord.....	4.95	0.860	3.00
8	QM.....	0.928	1.35	0.75
9	Sig.....	0.973	0.346	0.63
10	Trans.....	Negligible	Negligible	6.00
11	Total cl II and IV	9.52	12.2	24.70
12	Cl III.....	12.0	7.53	41.00
13	Cl V.....	13.4	8.68	1.40
14	Total..	42.6	34.4	75.9

¹ Based on operations in Europe, all armies—24 Feb 45 to 28 Mar 45.² Based on Sixth and Eighth Army operations—Dec 43 to Sep 44.³ Assumed from theater average—World War II.

Table B-5. Field Army and Corps in Combat

1	Item	STON per day	
		2 Per fld army ¹	3 Per corps ²
2	Cl I.....	1420.	346.
	Cl II & V:		
3	Air.....	0.133	Negligible
4	Cml.....	7.400	1.8
5	Engr.....	461.000	112.0
6	Med.....	20.700	5.0
7	Ord.....	916.000	223.0
8	QM.....	172.000	41.8
9	Sig.....	180.000	43.8
10	Total Cl II & IV..	1760.	427.
11	Cl III.....	2220.	540.
12	Cl V ³	2480.	603.
13	Total.....	7880.	1920.

¹ Computed for fld army of 3 corps, each corps composed of 3 infantry and 1 armored division, and including necessary supporting and service elements.² Computed for corps of 3 infantry divisions and 1 armored division, with necessary supporting and service elements.³ Class V data applicable for periods of 14 or more days.

Table B-6. Airborne Division in an Airborne Assault*

1	Item	2	3
		Lb per man per day	STON per div per day
2	Cl I.....	6.60	46
	Cl II and IV:		
3	Cml.....	0.00	0
4	Engr.....	1.00	7
5	Med.....	0.42	3
6	Ord.....	0.00	
7	QM.....	0.00	
8	Sig.....	1.04	7
9	Total Cl II and IV..	2.46	17
10	Cl III.....	1.70	12
	Cl V:		
11	Cml.....	0.20	1
12	Ord.....	41.00	285
13	Total Cl V.....	41.20	286
14	Total.....	52.0	361

*Nongas conditions.

Table B-7. Armored Division ^a

1	Item	2		3		4		5		6		7		8		9	
		Attack		Pursuit and exploitation		Defense		Reserve									
		Lb per man per day	STON per div per day	Lb per man per day	STON per div per day	Lb per man per day	STON per div per day	Lb per man per day	STON per div per day	Lb per man per day	STON per div per day	Lb per man per day	STON per div per day	Lb per man per day	STON per div per day	Lb per man per day	STON per div per day
2	Cl I.....	5.37	40	5.61	42	5.51	41	5.51	41	5.51	41	5.51	41	5.51	41	5.51	41
	Cl II and IV																
3	Cml.....	0.25	2	0.25	2	0.25	2	0.25	2	0.25	2	0.25	2	0.25	2	0.25	2
4	Engr.....	0.70	5	0.54	4	0.42	3	0.42	3	0.42	3	0.42	3	0.42	3	0.42	3
5	Med.....	0.30	2	0.30	2	0.15	1	0.15	1	0.15	1	0.15	1	0.15	1	0.15	1
6	Ord.....	14.10 ^b	105 ^b	2.14	16	2.00	15	2.00	15	2.00	15	2.00	15	2.00	15	2.00	15
7	QM.....	2.11	16	2.11	16	2.11	16	2.11	16	2.11	16	2.11	16	2.11	16	2.11	16
8	Sig.....	0.87	7	0.85	6	0.37	3	0.37	3	0.37	3	0.37	3	0.37	3	0.37	3
9	Total cl II and IV.....	18.30	137	6.19	46	5.30	40	5.30	40	5.30	40	5.30	40	5.30	40	5.30	40
10	Cl III.....	13.80	103	23.30	174	7.51	56	7.51	56	7.51	56	7.51	56	7.51	56	7.51	56
11	Cl V.....	50.0	375	8.8	66	53.2	400	53.2	400	53.2	400	53.2	400	53.2	400	53.2	400
12	Total.....	87.5	655	43.9	328	71.5	535	71.5	535	71.5	535	71.5	535	71.5	535	71.5	535

^a Nongas conditions.

^b Primarily battle losses of combat vehicles.

^c Increase over inactive situation due to intensified maintenance and replacement activities.

^d All elements of division out of combat.

Table B-8. Infantry Division
*a. Infantry Division—Offensive Operations**

1	Item	3		4		6		8		10	
		Attack of fortified position		Attack of deliberately organized position		Attack of hastily organized position		Pursuit		Assault of hostile shore	
		Lb per man per day	STON per div per day	Lb per man per day	STON per div per day	Lb per man per day	STON per div per day	Lb per man per day	STON per div per day	Lb per man per day	STON per div per day
2	CI I.....	5.72	51	5.37	48	5.46	48	5.61	50	6.19	55
	CI II and IV										
3	Cml.....	0.251	2	0.252	2	0.051	0.5	0.091	1	0.191	2
4	Engr.....	2.130	19	0.843	7	1.26	11.0	0.979	9	1.170	10
5	Med.....	0.301	3	0.301	3	0.125	1.0	0.111	1	0.221	2
6	Ord.....	1.670	15	1.670	15	2.83	25.0	2.080	18	0.769	7
7	QM.....	0.942	8	0.929	8	0.938	8.0	0.659	6	0.502	4
8	Sig.....	0.959	8	0.991	9	0.961	9.0	0.710	6	0.389	3
9	Total ci II and IV.....	6.25	55	4.98	44	6.16	55	4.63	41	3.24	28
10	CI III.....	4.93	44	7.92	70	8.47	75	15.3	136	4.56	40
11	CI V.....	47.8	430	44.4	400	42.8	386	7.7	69	43.3	390
12	Total.....	64.7	580	62.7	562	62.9	564	33.2	296	57.3	513

*Nongas conditions.

Table B-8—Continued
b. Infantry Division—Defensive Operations¹

1	Item	3		4		6		8	
		Covering, security force, retirement or delaying action		Defense of position		Inactive situation		Reserve	
		Lb per man per day	STON per div per day	Lb per man per day	STON per div per day	Lb per man per day	STON per div per day	Lb per man per day	STON per div per day
2	Class I.....	5.42	48	5.51	49	5.19	46	5.38	48
	Classes II and IV								
3	Cml.....	.361	3	.361	3	.251	2	.251	2
4	Engr.....	.811	7	1.46	13	.501	4	.159	1
5	Med.....	.121	1	.221	2	.151	1	.151	1
6	Ord.....	1.47	13	1.50	13	.829	7	1.25	11
7	Qm.....	1.32	12	1.10	10	2.11	19	2.11	19
8	Sig.....	.721	6	.989	9	.479	5	.479	4
9	Total II and IV.....	4.80	42	5.63	50	4.32	38	4.40	38
10	Class III.....	12.5	111	6.83	61	6.41	57	2.23	20
11	Class V.....	26.1	235	50.0	450	16.2 ²	146 ²	(²)	(²)
12	Total.....	48.8	436	70.0	610	32.1	287	12.0	106

¹ Nongas conditions.² All elements out of combat.

APPENDIX C

MISCELLANEOUS DATA

Table C-1. Weight Conversion Factors

1	2	3	4	5	6
Unit	Long tons	Metric tons	Short tons	Kilograms	Pounds
1 long ton =		1.0160	1.1200	1,016.0	2,240.0
1 metric ton =	0.9842		1.1023	1,000.0	2,204.6
1 short ton =	0.8929	0.9072		907.2	2,000.0
1 kilogram =					2.2046

Table C-2. Speed Conversion Factors

1	2	3	4	5	6	7	8
Unit	Knots	Statute miles per hour	Kilometers per hour	Feet per minute	Feet per second	Meters per minute	Meters per second
1 knot* =		1.1516	1.8532	101.34	1.6890	30.89	0.5148
1 mile per hour =	0.8684		1.6093	88.00	1.4667	26.82	0.4470
1 kilometer per hour =	0.5396	0.6214		54.68	0.9113	16.67	0.2778

*One knot—nautical mile per hour.

Table C-3. Power Conversion Factors

1	2	3	4	5	6
Unit	Kilowatts	Horsepower	Btu* per minute	Foot-pounds per second	Foot-pounds per minute
1 kilowatt =		1.34100	56.88	737.600	44,250.0
1 horsepower =	0.7457		42.42	550.000	33,000.0
BTU* per minute =	0.01758	0.02358		12.968	778.1

*BTU, or British thermal unit, is the quantity of heat required to raise the temperature of 1 pound of water 1° F.

Table C-4. Angular Measurement Conversion Factors

1	2	3	4	5
Unit	Radians	Degrees	Mils	Minutes
1 radian =		57.2958	1,018.600	
1 degree =	0.017453		17.778	60.000
1 mil =		0.05625		3.375

Note. 360° = 2π radians = 6,400 mils.

Table C-5. Linear Measurement Conversion Factors

1	2	3	4	5	6	7	8	9	10	11
Unit	Nautical miles*	Statute miles	Kilo-meters	Cable lengths	Fathoms	Meters	Yards	Feet	Inches	Centimeters
1 nautical mile =		1.1509	1.8519	8.439	1,012.7	1,852.0	2,025.4	6,076.115	72,913.0	182,918.3
1 statute mile =	0.8681		1.6093	7.333	880.0	1,609.3	1,760.0	5,280.0	63,360.0	160,933.0
1 kilometer =	0.5393	0.6214		4.557	546.8	1,000.0	1,093.6	3,281.0	39,370.0	100,000.0
1 cable length =	0.1183	0.1364	0.2195		120.0	219.5	240.0	720.0	8,640.0	21,945.0
1 fathom =						1.829	2.0	6.0	72.0	182.88
1 Meter =					0.5468		1.0936	3.281	39.37	100.0
1 yard =					0.5000	0.9144		3.0	36.0	91.44
1 foot =					0.1667	0.3048	0.3333		12.0	30.48
1 inch =								0.0833		2.54
1 centimeter =								0.0328	0.3937	

*The nautical miles is the same as the International Nautical Mile. In some texts the nautical mile may appear as 6080.20 feet.

Table C-6. Surface Measurement Conversion Factors

1	2	3	4	5	6	7	8	9
Unit	Square miles	Square kilometers	Hectares	Acres	Square rods	Square meters	Square yards	Square feet
1 square mile =		2.59	259.0	640.0	102,400.0	2,589,945.0	3,097,600.0	
1 square kilometer =	0.3861		100.0	247.1	29,537.0	1,000,000.0	1,196,010.0	
1 hectare =		0.010		2.471	395.4	10,000.0	11,960.0	17,641.0
1 acre =			0.4047		160.0	4,047.0	4,840.0	43,560.0
1 square rod =						25.29	30.25	272.25
1 square meter =					0.03954		1.1960	10.764
1 square yard =					0.03306	0.8361		9.000

Table C-7. Volume Measurement Conversion Factors

1	2	3	4	5	6
Unit	Cubit feet	Imperial gallons	U.S. gallons	Liters	Quarts
1 cubic foot =		6.229	7.481	28.32	29.92
1 imperial gallon =	0.16054		1.2010	4.546	4.804
1 U.S. gallon =	0.13368	0.8327		3.785	4.000
1 liter =	0.03532	0.2201	0.2642		1.0567
1 measurement ton =	40.0				
1 barrel (petroleum) =	5.61		42.0		

Table C-8. Speed of Sound Physical Constants

1	2	3	4	5	6	7	8
Unit	In air (at ° F.)					In water	
	-10°	0°	30°	70°	100°	Fresh	Salt
Feet per second =	1,039	1,050	1,083	1,127	1,171	4,700	4,752
Miles per hour =	708	716	738	768	797	3,205	3,246
Centimeters per second =	31,669	32,004	32,932	34,350	35,692	143,256	144,840
Kilometers per hour =	1,139	1,152	1,188	1,236	1,283	5,158	5,224

Table C-9. Other Physical Constants

1	2	3
Constant	Unit of measure	
	Metric	Nonmetric
Speed of light	229,330 km/sec	186,000 mi/sec
Acceleration due to gravity	981 cm/sec/sec	32.2 ft/sec/sec
Atmospheric pressure equal to theoretical	10,366 kg/sq meter	14.7 lb/sq in
maximum height of column of water, by suction	1,033 cm	39.9 ft
Circumference of earth at Equator	40,075 km	24,902 mi
Time between moons	29 days, 12 hr, 44 min	



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